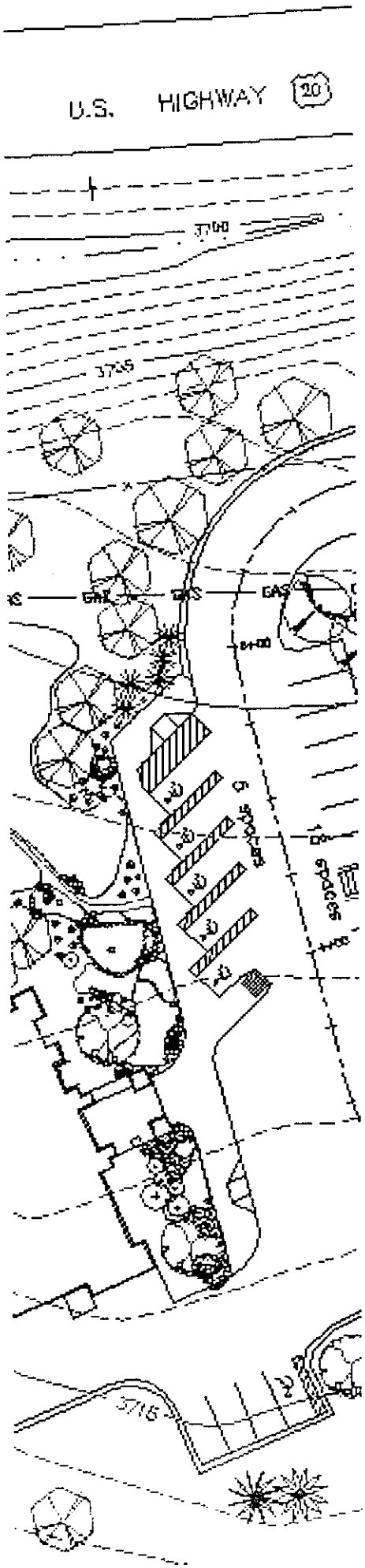

AutoCAD User's Guide

November 2000

DRAFT VERSION 1.0

Rocky Mountain Region

Introduction

The following AutoCAD User's guide was compiled by the Regional Office Center for Design and Interpretation (CDI) and represents an initial first draft for review by AutoCAD standards committee members (see Contributor/Reference page near back of document), and all Region 2 users. These standards are intended for Forest Service employees throughout the region, as well as architectural and engineering (A&E) contractors for the use in the preparation of Computer Aided Design and Drafting (CADD) construction and design drawings for the Forest Service. While this guide is a first draft, many of the standards and conventions can be implemented immediately at the discretion of the design team. A final guide is scheduled to be completed by end of FY2001.

The purpose of this document is to establish standards, which will result in the preparation of consistent and compatible AutoCAD files. It is intended to guide users in the overall CADD system, operations, and to establish standards and procedures that will avoid duplication of effort and maintain uniformity of work.

This manual also contains operational guidelines for users of the AutoCAD system located in the Regional Office in document management, file backup and restoration procedures, and plotting.

Suggestions for improvement are strongly encouraged and welcomed so that subsequent updates will reflect the needs and input of the users. Recommendations or suggestions should be emailed to:

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jkehm@fs.fed.us

Rocky Mountain Region
CENTER for DESIGN & INTERPRETATION
CDI

Future updates to this document may be viewed or downloaded from the CDI AutoCAD web site: http://fsweb.r2.fs.fed.us/eng/cdi/cadd

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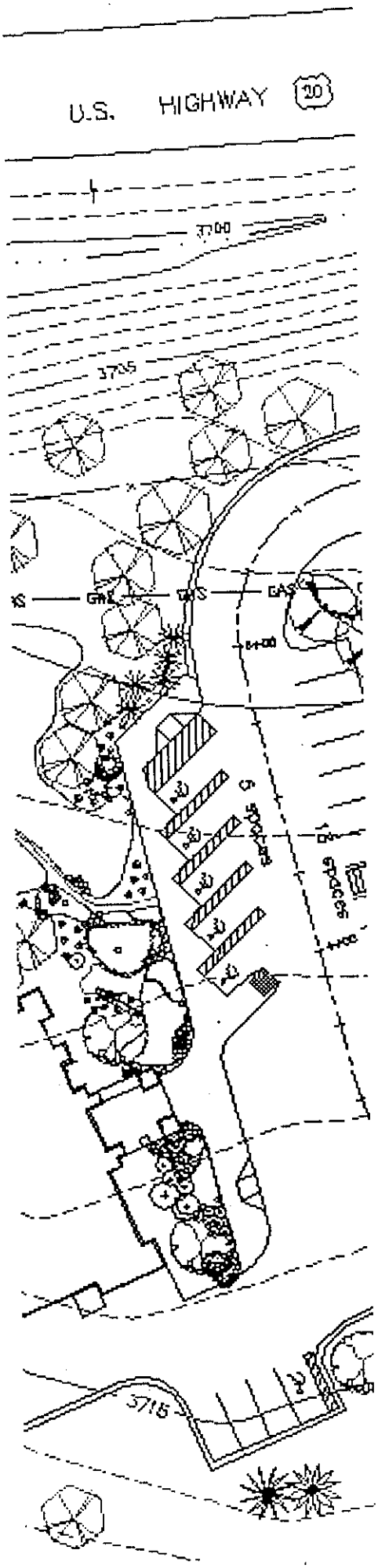


Chapter 1

General Standards

General Standards

These general standards are intended to include the fundamental requirements for the efficient use of the AutoCAD system within Region 2. Some of these standards will be repeated and further explained in other more specific sections.

The following are the basic standards for the Forest Service / Region 2.

All CAD drawings will be done in AutoCAD or AutoDesk related software.

All drawings will be drawn at true scale and true coordinates in model space.

All plots will be made from paper space at 1:1 (full size), and 1:2 (half size).

All externally referenced (xref) drawings will be attached (or overlaid) into the subsheet at 0,0,0.

All line widths can be set at the plotter or in the model.

– All colors used in drawing files will comply with the Pen/Color configuration.

–All drawings will contain a date stamp that includes the AutoCAD release number, the drawing pathname, the filename, and the latest date worked on.

- No changes or additions will be made to the 'base' sheet by disciplines using this base as an external reference (xref).

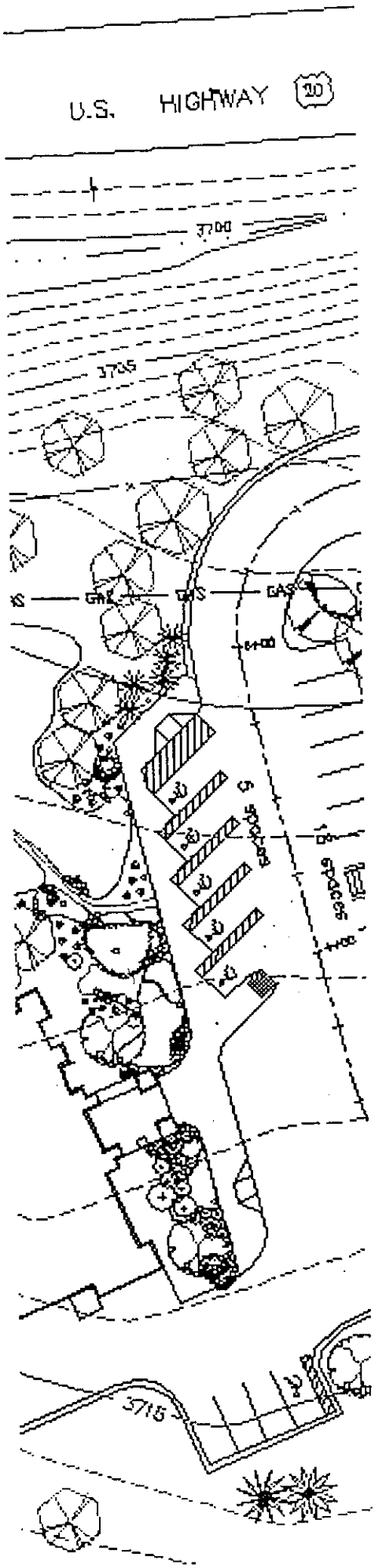
Layer names will conform to CAD standards and all drawing elements will be drawn on the appropriate layer. All layers will be named using the discipline designation the drawing element represents as the first letter.

1 Layout per DWG

Each subsheet will be created as an individual .dwg file, using external references for the sharing of information, when necessary. One single drawing file containing multiple subsheets is not acceptable.

All text will be in CAPITAL letters.

The paper size used for plotting will be 22"x34" (full-size) and 11"x17" (half-size). Border sheets are inserted at full size into drawing.



Chapter 2

Drawing Management

Drawing Management

To ensure accessibility of all drawing files and external references during ongoing design and construction efforts and for archival and retrieval purposes, it is imperative that we set and maintain a standard folder structure.

Folder and File Naming Conventions

File organization is a necessity in managing CADD drawings. By stacking folders, the user can distinguish between forest, project, project number, file type, and the specific filenames. All CADD users shall follow the specified folder structure and file naming conventions as shown in Figure 2.1 in preparing CADD drawings for the Forest Service.

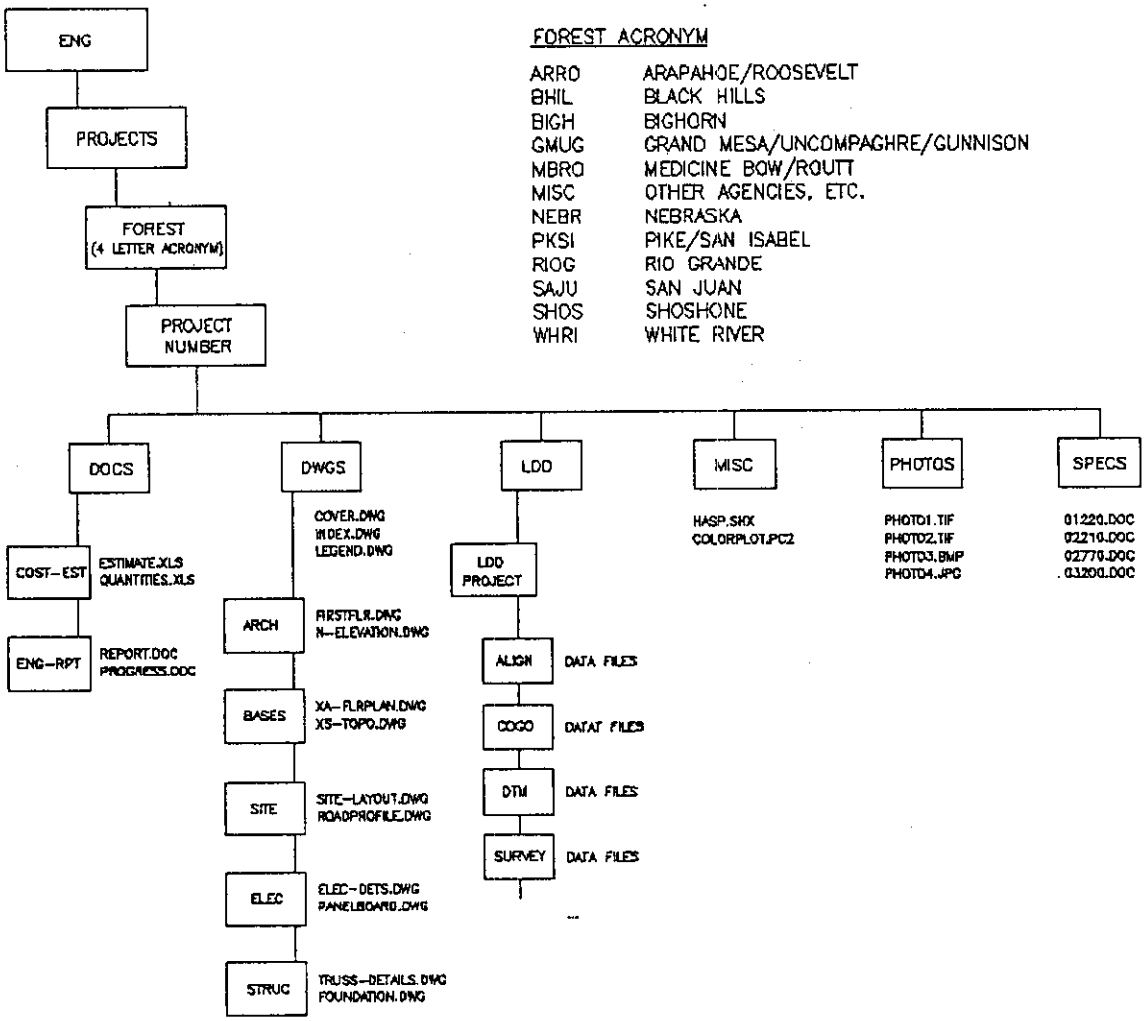


Figure 2-1

Folder Naming Conventions

To assure file sharing and accessibility to all users, the following folder structure should be used.

K:\ENG	Disk Drive
FOREST\	4 Letter Forest Designation
PROJECT NAME\	Project Name
PROJECT NUMBER\	Project Number (i.e. MB-105)
DIRECTORY\	Docs, Dwgs*, Misc, Photos, LDD, etc.
FILE NAME	Drawing or File Name (.dwg/.doc/.tif)

Examples: **k:\projects\mbro\mirrorlake\mb-105\dwgs\siteplan.dwg**
k:\projects\gmug\amphitheater\gm-227\cost-est\estimate.xls

* - Sub-folders may be created under the ***Dwgs*** folder such as 'Bases' or any discipline (i.e.: Arch, Elec, Mech, Rec, Site, Struc, etc.) that will help better organize the project drawing files. The ***Bases*** folder is the designated location for storing all drawings that are created to be used as 'base' drawings and accessed as an external reference (xref). This folder is to be used for locating any base sheet needed by another discipline. (i.e.: mechanical designers may need to xref the architectural floor plan which will be used as the base for their mechanical design). All base drawings will be located in one folder, with the file name indicating the specific type of base. (See Base Folder File Naming)

File Naming

File names will consist of a maximum of twenty (20) characters, including spaces. The file name should try to best describe the design content of each specific drawing sheet. When naming files, it is advised to precede the name with the sub-sheet number. This is helpful in quickly locating the file for revision or plotting in a directory full of project drawings.

We cannot use long file names with e.b.s.

Examples:

L3-GRADING PLAN.DWG
G2-SITE DEMO.DWG
M1-FIRSTFLR-HVAC.DWG
E6-PANELBOARD SCHED.DWG

Base Folder File Naming

In naming base drawings to be used as external references (xrefs), all files should begin with an "x", to distinguish it as an xref. The architectural base sheets shall begin with an xa, the civil base sheets shall begin with an xc, the site base sheets shall begin with an xs, etc. The remaining digits should be as descriptive as possible in describing the content of the base sheet. Naming base drawings this way will generate consistency and organization within the final drawing, as well as provide better documentation management.

Examples:

XA-FLRPLAN.DWG
XC-SITE.DWG
XS-LAYOUT.DWG
XE-EXCOND.DWG
X-TOPO (non-discipline)

Layering

The layering standards to be used on FS CADD drawings follow, in general, the AIA CAD Layer Guidelines, prepared by the AIA Task Force on Cad Layer Guidelines.

The AIA CAD Layer Guidelines give two methods for sharing graphic information. The single file approach, in which drawings are created by turning layers on and off, is **not** to be used on FS drawings. The second method, **which is to be used on FS drawings,** is the multiple file approach. This allows a drawing to be created by using reference files (xrefs). This method allows for a total team approach and easier file sharing.

Drawings that are to be used as external reference drawings, or base sheets, should be saved to the ***'bases'*** directory, to be available to all users needing a base drawing for their specific discipline. Base drawings should contain only the necessary information needed for use by other disciplines, but not the information specific to the original discipline. This way base drawings can be utilized immediately, without the need to analyze and manipulate.

Any base drawing to be used as an xref shall have all objects created **color by layer** only. This allows for easier pen weight modification, when necessary.

Layer Formats

The layering formats are organized as a hierarchy. This structure makes the list easier to use and accommodates future expansion. Layer names are alphanumeric and use easy-to-remember abbreviations such as A-DOOR for architectural doors, A-WALL for architectural walls, and C-GRADING for proposed contour lines and elevations.

Major Groups Designation

Major groups correspond to the traditional discipline designations used in construction document sub-sheet numbering.

Major Group Designations:	G	General
	C	Civil
	L	Landscape Architecture
	A	Architecture
	S	Structural
	M	Mechanical (HVAC)
	P	Plumbing
	F	Fire Protection
	E	Electrical

Layer names shall be limited to 25 characters. Hyphens are used to separate major group designation letter and layer description to improve readability.

Drawing Templates

There are standard template drawings (.dwt) available for use on AutoCAD drawings. Each template has a master list of layers for the specific discipline. Layers can be added or purged as needed. These templates can be found on the Regional Office file server in the k:\cadd\support\proto folder, or accessed through the Center for Design and Interpretation (CDI) website.

The drawing templates are:

arch.dwt	Architectural drawings
civldetl.dwt	Civil drawings - detail sheets (inches)
civlsite.dwt	Civil drawings - plans (decimal,feet)
covproj.dwt	Cover sheet - project specific information
elec.dwt	Electrical drawings
elecaux.dwt	Electrical drawings (Auxiliary systems)
fire.dwt	Fire Protection drawings
ladetl.dwt	Landscape architecture drawings - detail sheets (inches)
lasite.dwt	Landscape architecture drawings - plans (decimal, feet)
mech.dwt	Mechanical (HVAC) drawings
plumb.dwt	Plumbing drawings
struct.dwt	Structural drawings

The layers in these drawing templates have been created with color number and linetype. Color number (pen weights) can and should change relative to the scale of the drawing.

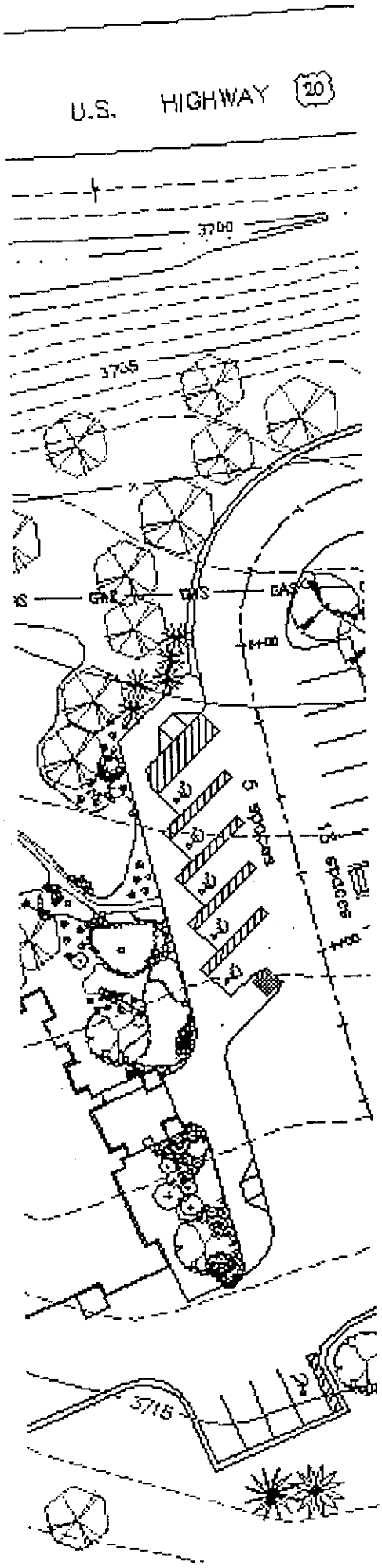
See Appendix A for FS standard template drawing layer lists.

Common Layers

There are three common layers preset in these templates. They are:

Z-CONST	- for construction lines
Z-NOPLOT	- for no plot graphics or notes
Z-SYMS-GENR	- for general symbols specific to the sheet (north arrow, scales, etc.)

These layers are prefixed with a "Z", in an effort to keep the layers organized, with the "Z-" layers always listed last in the layer list.



Chapter 3

Drawing Format

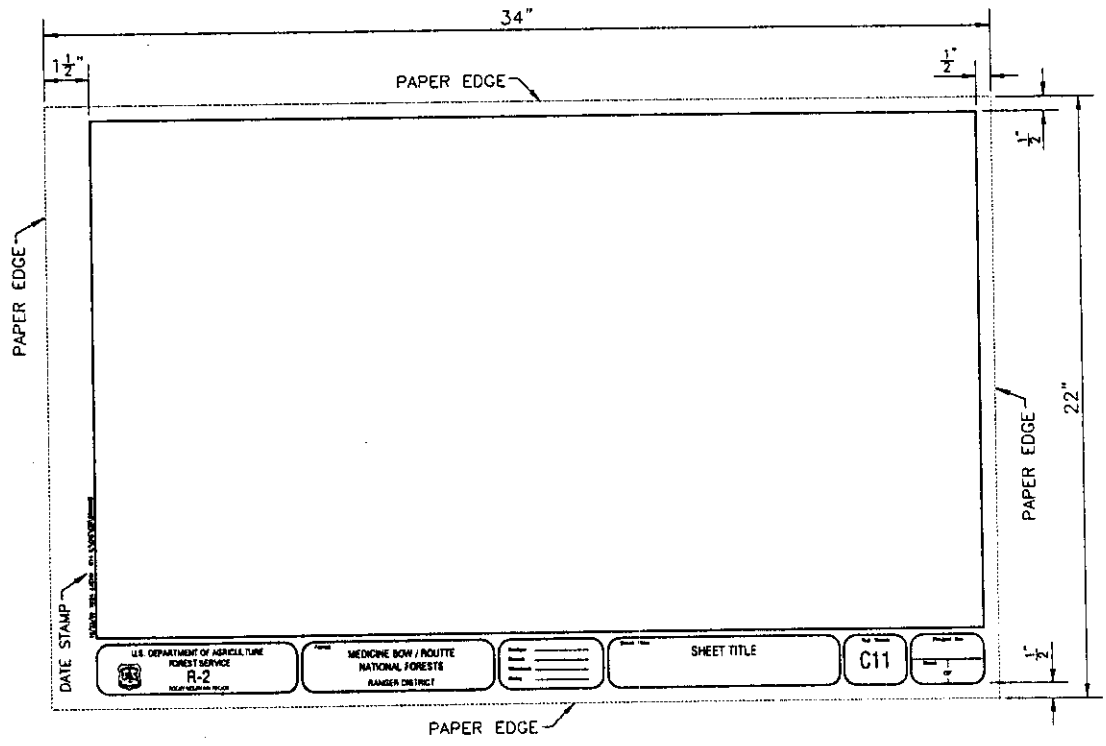
Drawing Format

Standard Sheets

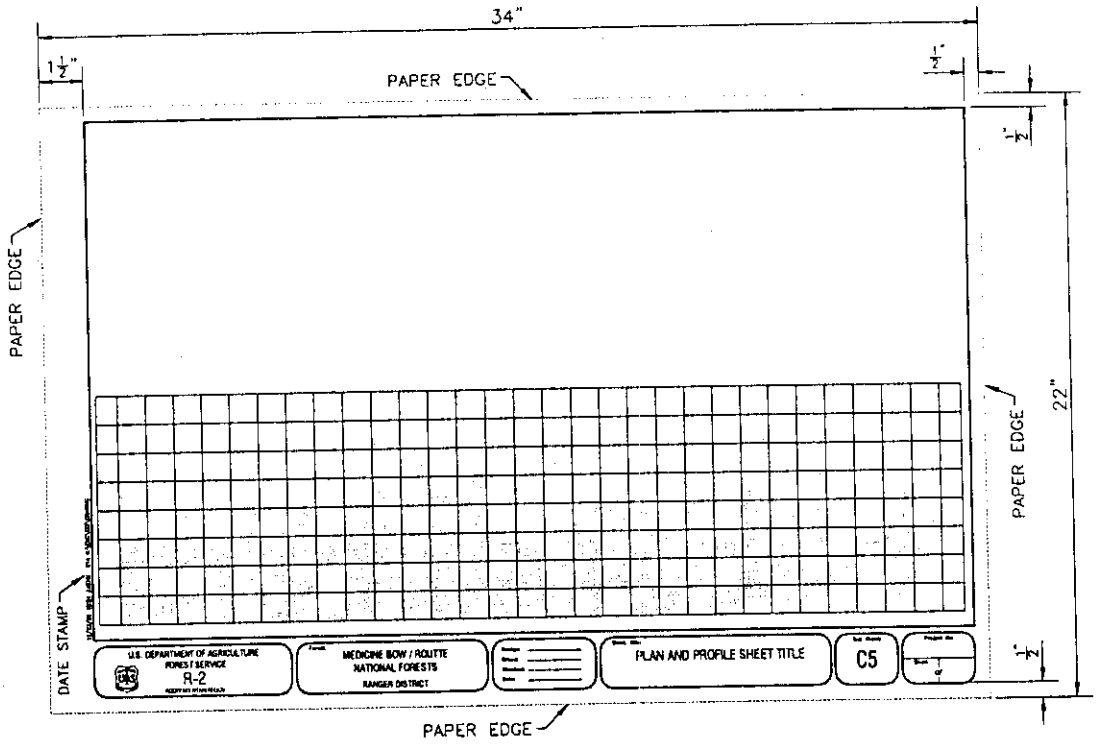
Standard 22"x34" (full-size) and 11"x17" (half-size) Forest Service drawings sheets are used for design and construction drawings. See Figure 3-1 for our standard sheet border, which also shows the location of date stamp and required paper margins. See Figure 3-2 for the standard plan and profile sheet border. Figure 3-3 shows a typical cover or title sheet configuration.

Standard sheets include:

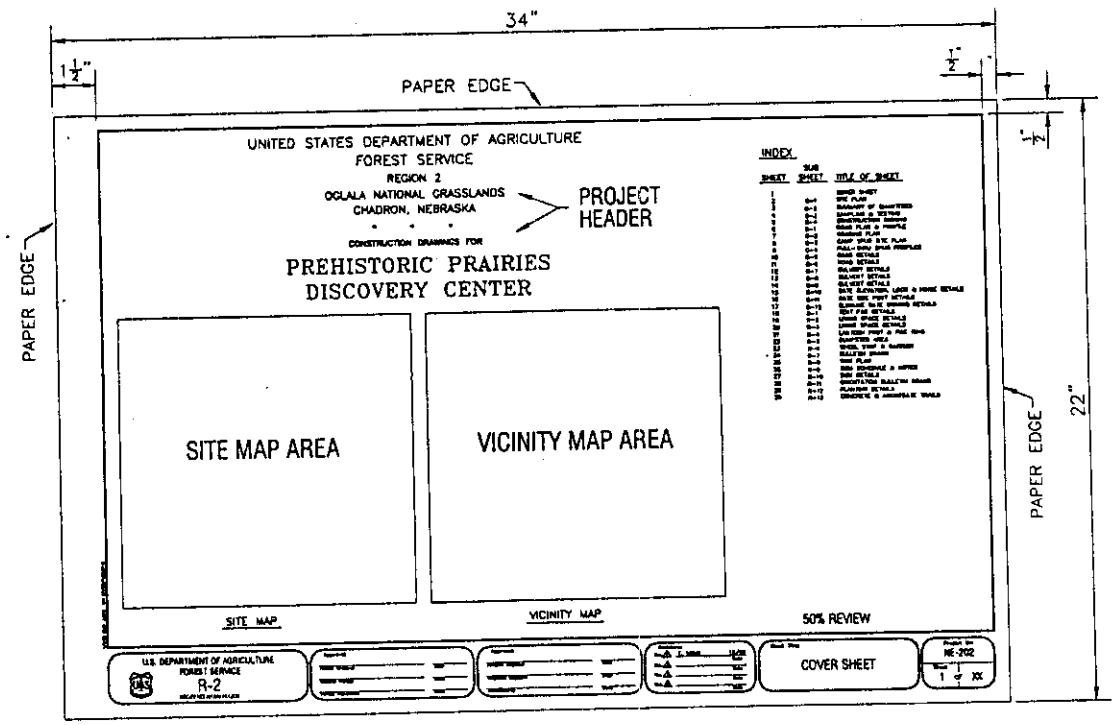
- **Cover Sheet** - Standard cover sheet with vicinity, project map and index.
- **Second Sheet** - Standard border sheet.
- **Plan and Profile Sheets** - These are standard second sheet borders, with grids for a plan and profile sheet and a full profile sheet.



Standard Sheet Border
Figure 3-1



Standard Plan and Profile Sheet Border
Figure 3-2

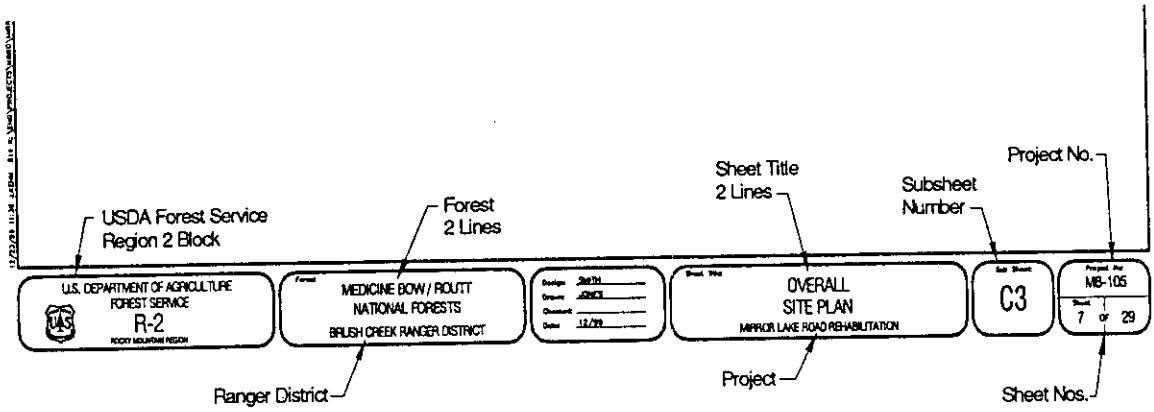


Typical Cover Sheet Configuration
Figure 3-2

Title Blocks

The title block on a standard sheet includes the drawing title; project name; project number; name of forest(s); ranger district; designer, drafter, and reviewer's names; date; sub-sheet number as well as sheet number and total sheets. See Figure 3-4.

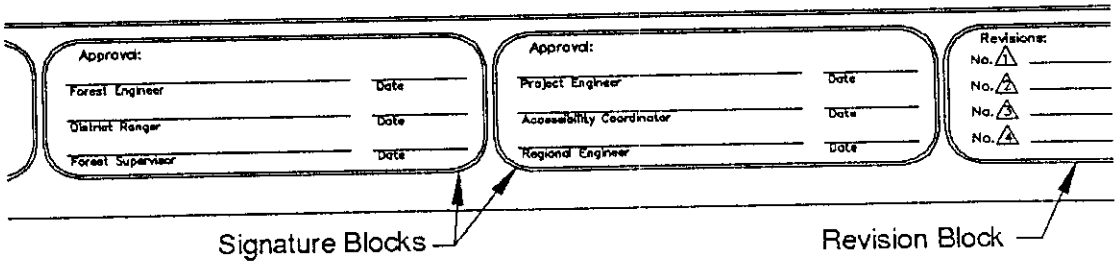
Title blocks on a cover (or title) sheets includes two approval (signature) blocks, a revision block, and % review status. See Figure 3-5.



Standard Border Sheet Title Block
Figure 3-4

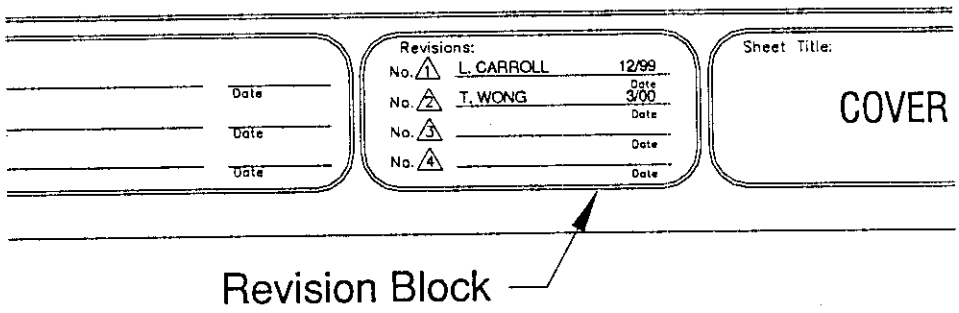
Approval and Revision Blocks

Approval Blocks - Two approval blocks are located on the cover sheet of all design and construction drawing sets. See Figure 3-5 for the approval blocks to be used on the cover sheet of all design drawing sets.



Cover Sheet Signature and Revision Blocks
Figure 3-5

Revision Block - A revision block is required when changes are made to construction drawings, which have been issued for bid and therefore are official contract documents. See figure 3-6 for completion of revision block.



Revision Block
Figure 3-6

With each revision to the construction set of drawings, a revision triangle should appear where any changes have occurred within the set. For example, on every sheet (including the cover sheet) where there has been a drawing amendment to the site, layout information, details, or annotation, etc...a revision triangle with the appropriate number should be appear next to the change. To help draw attention to the revision on a busy sheet, a revision cloud around the change may also be included if desired. Figure 3.7 depicts a change to a detail and the annotation.

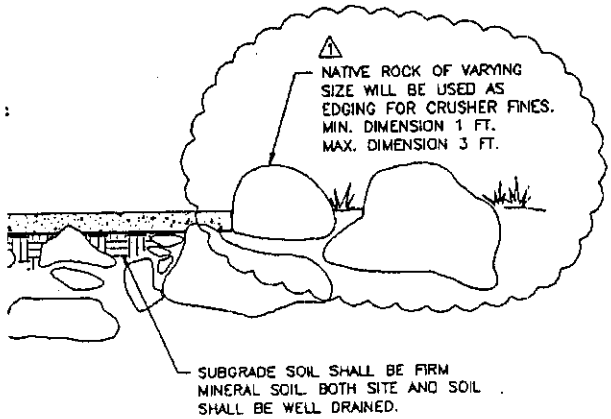


Figure 3-7

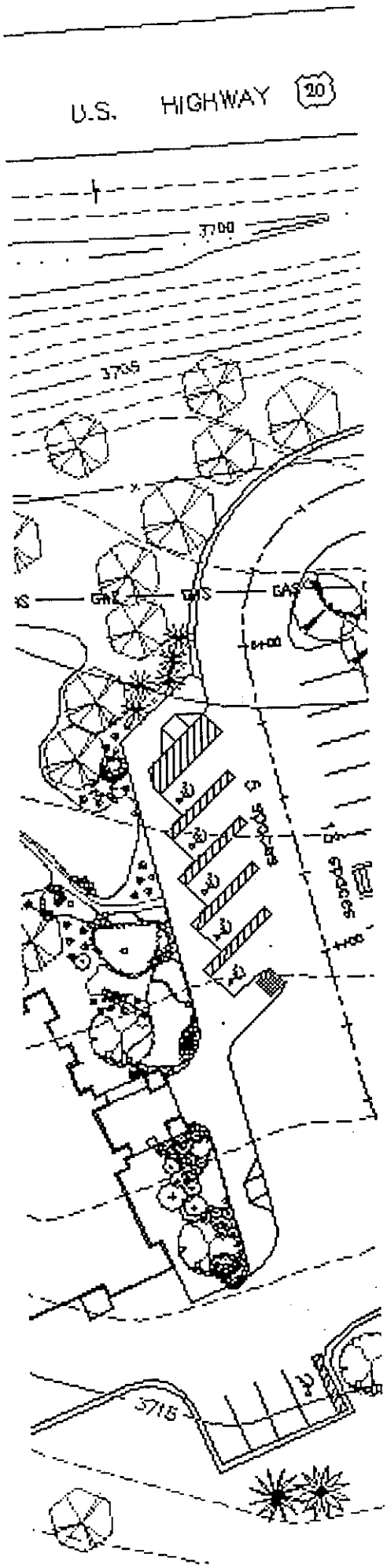
Date Stamp

Each drawing needs to contain a date stamp that includes the AutoCAD release number, the drawing pathname, the filename (including any external references), and the latest date the file was worked on. It is to be located vertically, on the left side of the border sheet, outside the border. This date stamp is written into the customization of our border sheet drawings and when using our 2nd sheet borders, the date stamp will automatically be updated each time the drawing is saved. To insert this date stamp on existing drawings, you can access the "auto stamp" icon from the icon menu. Figure 3-8 below shows samples of the date stamp.

3/1/00 15:03 A.MAY R14 K:\PROJECTS\GMUG\AMPHITHEATER\GM-227\DWGS\L3-SITELAYOUT

6/18/00 8:03 G.HANNA R2000 K:\PROJECTS\PKSI\WILKERSON\PS-214\DWGS\C5-RDPROFILES

Automatic Date Stamp
Figure 3-8



Chapter 4

Drafting Practices

Drafting Practices

All FS construction drawings are issued to prospective bidders as nominal half size prints. All drawings must be capable of being reproduced as clear and legible half-size prints. Line quality and adequate lettering size are essential to meet these requirements. By following the recommended line weights and the Standard Pen/Color Configuration (Figure 4-3), all drawing files will be able to be reproduced as clear and legible half size drawings.

Line Weights

Any new work should be easily distinguishable from other information shown on the drawings. Show new work at 100% (unscreened) and show existing site conditions, including text, screened at 50%. Existing conditions on details may be screened at 50%, but leadered text to screened portion of detail should still be 100% and indicate the words 'existing' in the annotation. Contours are screened at 40% for better clarity. (Index contours should be a continuous line type with annotation, and intermediate contours dashed).

Varying line widths on drawings substantially improve their readability. The line widths shown in Figure 4-1 have been established as the standard line widths for FS AutoCAD drawings. No line weight should be less than .004" in thickness (for full-size).

Color	Color Number	11" X 17" Line Weight when Plotted	22" X 34" Line Weight, when Plotted	Example	Equivalent LEROY® Lettering Set Pen
Red	(1)	0.002"	0.004"		0000
Yellow	(2)	0.004"	0.008"		000
Magenta	(6)	0.006"	0.012"		00
White	(7)	0.008"	0.016"		0
Cyan	(4)	0.010"	0.021"		1
Green	(6)	0.013"	0.026"		2
Blue	(5)	0.016"	0.033"		3
Orange	(30)	0.025"	0.050"		5

Figure 4-1

Pen Colors

Colors relate to pen weights (line widths) that are mapped to the plotters. The AutoCAD Color Wheel (Figure 4.2) displays all the 256 colors and shades available. Color numbers ending in 8 or 9 (i.e. 78, 109, 228, etc.) are NOT recommended for use since they are very hard to see on a black background screen. Pen '8' has been designated as a 'No-Plot' pen. Although you would see the gray color on your screen, the color does not plot.

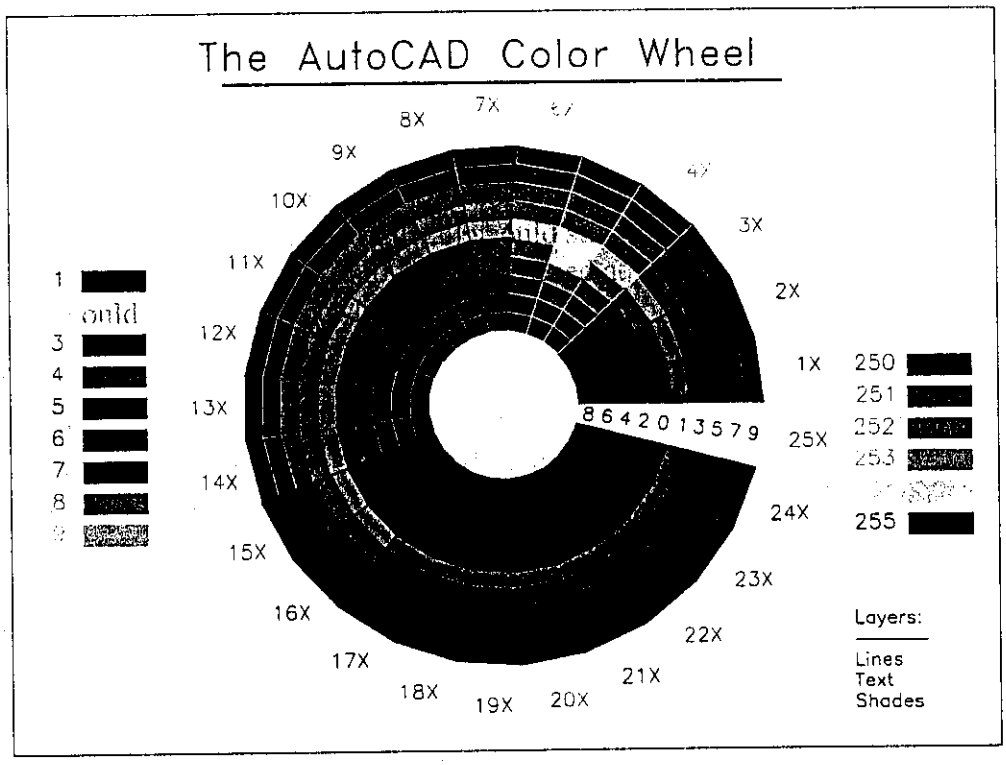


Figure 4-1

All drawings will be generated using the FS Pen/Color Configuration. (See Figure 4-3.) Pen Configuration files (.pcp) and (.cbt) are available for both half size and full size drawings. When plotting, all colors plot in black or grayshades depending on their configuration (exception: pen 8 – no plot). Screen percentages available include 100%, 50%, and 40%. Drawings with thin 40% screen pens should limit their use to non-critical background information, as they do not plot with much clarity.

PEN / COLOR CONFIGURATION

Line Width (inches)	% Screen		Color Numbers		Rapido
.004	100	red	1, 28,50,71,92,113,134,155,176,197,218,239		0000
.008	100	yellow	2, 29,51,72,93,114,135,156,177,198,219,240		000
.026	100	green	3, 31,52,73,94,115,136,157,178,199,220,241		2
.021	100	cyan	4, 32,53,74,95,116,137,158,179,200,221,242		1
.033	100	blue	5, 33,54,75,96,117,138,159,180,201,222,243		3
.012	100	magenta	6, 34,55,76,97,118,139,160,181,202,223,244		00
.016	100	white	7, 35,56,77,98,119,140,161,182,203,224,245		0
No Plot	-	dk. gray	8	*(trim lines, viewport frames)*	
.015	40	gray	9	*(misc. background base info)*	0
.004	50		11, 36,57,78,99,120,141,162,183,204,225		0000
.008	50		12, 37,58,79,100,121,142,163,184,205,226		000
.026	50		13, 38,59,80,101,122,143,164,185,206,227		2
.021	50		14, 39,60,81,102,123,144,165,186,207,228		1
.033	50		15, 40,61,82,103,124,145,166,187,208,229		3
.012	50		16, 41,62,83,104,125,146,167,188,209,230		00
.016	50		17, 42,63,84,105,126,147,168,189,210,231		0
.004	40		21, 43,64,85,106,127,148,169,190,211,232		0000
.008	40		22, 44,65,86,107,128,149,170,191,212,233		000
.026	40		23, 45,66,87,108,129,150,171,192,213,234		2
.021	40		24, 46,67,88,109,130,151,172,193,214,235		1
.033	40		25, 47,68,89,110,131,152,173,194,215,236		3
.012	40		26, 48,69,90,111,132,153,174,195,216,237		00
.016	40		27, 49,70,91,112,133,154,175,196,217,238		0
.050	100		10		5
.050	50		20		5
.050	30		30		5
.012	40	dk. gray	250,251	*(minor contours)*	00
.020	40	gray	252,253	*(major contours)*	1

- Blue numbers (ending in 8 or 9) are considered to dark to see on a black screen background and *not recommended* for use.

Figure 4-3

Lettering Text Height

The following pen and lettering sizes are recommended for full size drawings so that text will be easily readable after drawings are reduced to half-size.

Standard text height is .130 and should be maintained for most drawing annotation. A minimum lettering height of .100 is acceptable, when used for special purposes such as symboling or stacked fractions.

Standard lettering sizes/color numbers:

.130 text height	Color No. 7	(.016 width)	standard text and dimensioning
.150 text height	Color No. 4	(.021 width)	sub-titles, headings
.175 text height	Color No. 3	(.026 width)	plan titles, detail titles, section titles, section or detail callouts, etc.

See Figure 4-3, FS Pen Color/Configuration chart, for color numbers for screened text.

Text Styles

Standard text fonts (styles) to be used on all FS drawings are roman simplex (romans.shx), or architectural (architxt.shx). See Figure 4-4 for examples of the lettering styles. The romans.shx font provides the maximum readability and transportability of text entities between CADD drawings. The clarity of this font provides the ability to plot readable text at height of 0.100 (FS minimum) inches. The architxt.shx font is not a standard AutoCAD font, but has been approved as an option for architectural style text. It is available to all R2 CADD users through the Regional Office file server under k:\eng\cadd\support\fonts directory. For users outside of the Forest Service, the architxt.shx font is obtained through the CDI AutoCAD (CADD) web page or in the FS AutoCAD 2000 Customization disk.

Lettering Styles

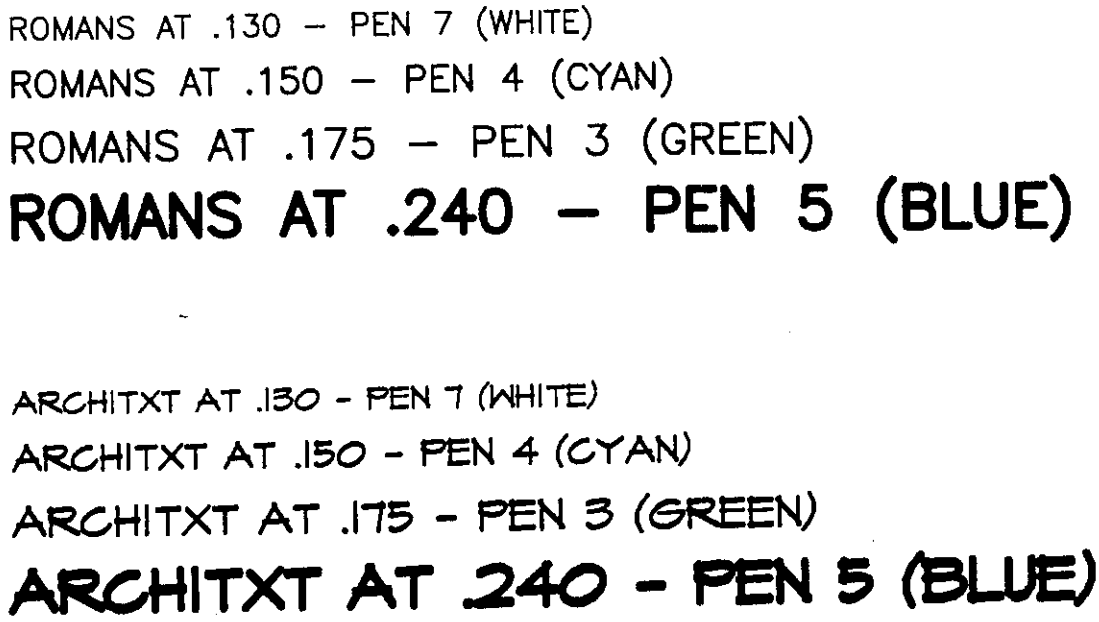


Figure 4-4

Text Setup

TWIZ - An AutoCAD command that has been created at CDI to simplify text setup within an AutoCAD. 'TWIZ' (Text Wizard) configures your text styles based on user selected options. The command can be entered at the AutoCAD command prompt, selected from the FS General Toolbar, or selected from the Command Add-ons located in the FS pull down menu at the top of your AutoCAD screen.

Dimensions

DWIZ - Another AutoCAD command created at CDI for dimension setup. "DWIZ" (Dimension Wizard) configures your dimension styles based on user-selected options. This command can also be entered at the AutoCAD command prompt, selected from the FS General Toolbar, or selected from the Command Add-ons located in the FS pull down menu.

Both **TWIZ** and **DWIZ** are bonus tools included with the FS AutoCAD Customization available through the CDI AutoCAD (CADD) web page. (See Chapter 5)

Standard Details

In continuing with our efforts to keep layers at a minimum, our layering standard for details will incorporate only the necessary layers needed for editing the details easily.

The list below defines the needs that should be met to insure compatibility with Forest Service AutoCAD drawings.

- All details shall be drawn full size in model space
- Any details that are non-scaleable should be drawn at actual plot size (i.e.: mview 1xp)
- Layering shall be as follows (with c indicating civil - for discipline type)

Layer Name	Description
c-detl	for objects and anything other than annotation and hatching
c-detl-anno	for text and dimensioning
c-detl-hatch	for hatch patterns
z-noplot	for user information

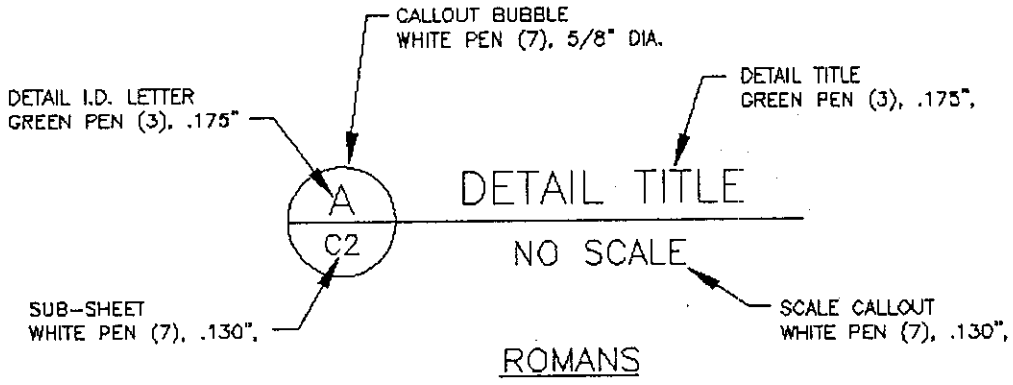
- Architectural detail layers would then start with an a-
- LA detail layers would start with an l-
- Electrical detail layers would start with and e-
- etc.

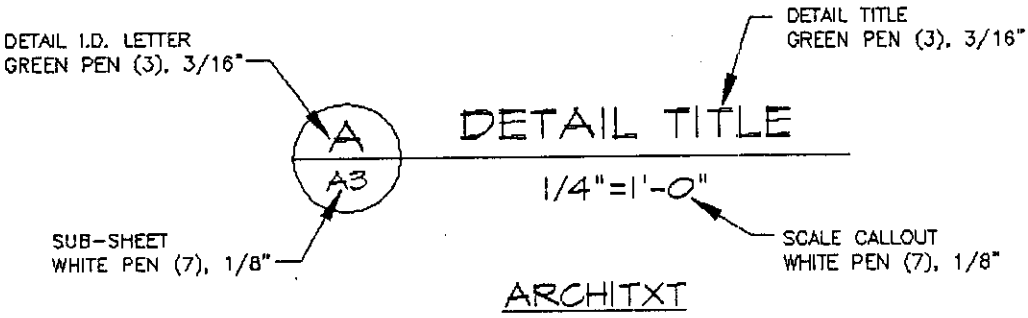
- Dimension style should be associative
- Use standard Forest Service text styles
- Hatch should be associative
- Creator shall use the z-noplot layer for user information such as plot scale, etc. (Place a note below the detail on this z-noplot layer indicating the scale of the annotation, etc.)
- Details should be drawn following standards identified in this guideline to insure compatibility and half-size reproducibility.
- Drawings should be for 22"x34" format and scaled to half size, if required, at printer/plotter.
- Details should be drawn using the FS CADD Standard Pen/Color Configuration.
- Bar scales should be included when a scale is indicated.

Detail Titles

Drawing details are titled with the following bubbled title bar. In the FS AutoCAD Customization there is a lisp routine that will prompt the user for title information, sheet number, and scale; and insert the title bar automatically. The user also has a choice between romans and architxt fonts depending on their particular discipline. This title bar can also be edited using the attribute editing command (dda, or ddatte).

Detail Title Examples:



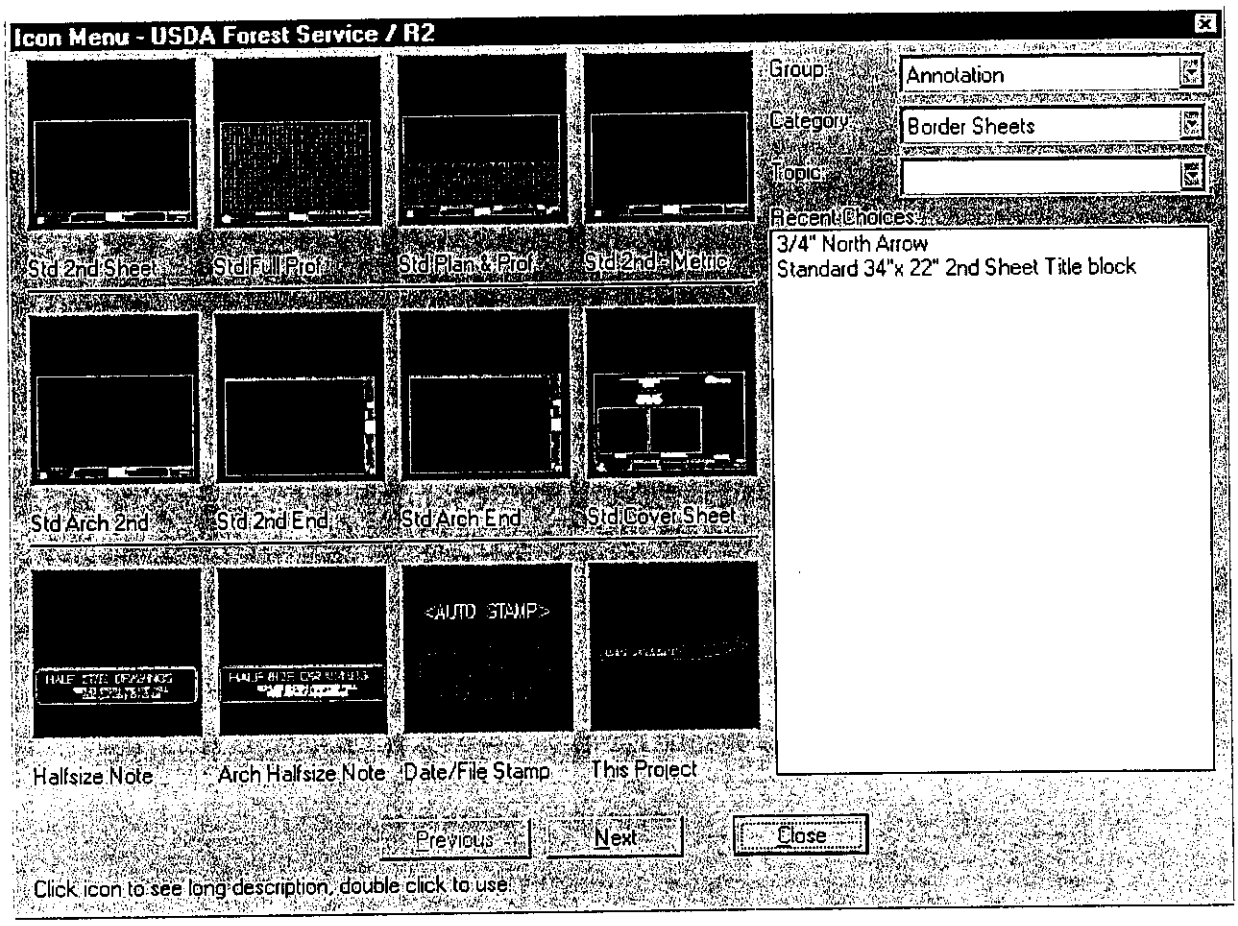


Symbols

Icon Menu

The graphic symbols to be used on FS design and construction drawings can best be accessed through the icon menus by selecting the icon menu icon from the discipline specific toolbars. The icon menu can also be accessed by typing "IM" at the command prompt and selecting the descriptive group, category and topic (in that order) that the symbol would be found under. When group, category and topic are selected, the icon menu will then display the related symbols.

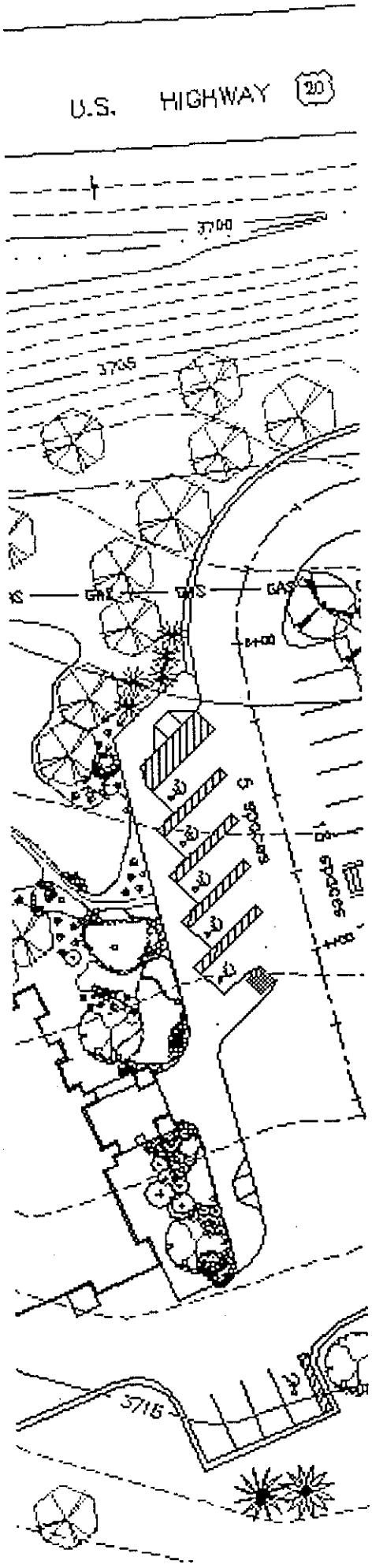
Below is an example of the symbol icon menu. In this case, the group is "Symbols", the category is "Border Sheets".



Below each symbol on the icon menu is a short description of the individual symbol. For a more complete description, click on the icon once. A longer description will appear on the

lower left corner of the icon menu. To access the symbol for placement on a drawing, double click on the symbol. Once a symbol has been selected, the user will be prompted for placement specifics, such as units, scale, insertion point, rotation angle and attributes. The prompts will vary depending on the individual symbol and its common use. On the right hand side of the icon menu, there is a "Recent Choices" box. This box will list the symbols that have been most recently accessed. Double clicking on a symbol description in this list can also access symbols.

Some FS standard symbols produce graphics using a series of commands (lisp routines) based on user input, such as border sheets, section cuts, title and detail callouts and some discipline specific symbols. These are also accessible from the icon menu.



Chapter 5

Customization

Customization

This section is designed to give information on AutoCAD customization that has been developed for the Forest Service. Repetitively used setups, commands and symbols have been customized and made available to users to add additional functionality to the AutoCAD program, specific to the needs of the design and construction program.

Note:
If you're on the Regional Office network, once your AutoCAD is properly configured, you'll see the FS pulldown menu in AutoCAD. If you're not on the RO network, you can install the AutoCAD customization on your PC. This customization is available on the CD-ROM (included with this User's Guide) or you can download it from the following WEB site: http://xxxxxxx.

The FS Pulldown Menu

The FS pulldown menu, located on the AutoCAD menu bar, contains access to customized commands and toolbars created for Region 2 use. The FS pulldown menu offers three options:

- Command Add-ons - A list of custom commands
- Toolbars - Discipline specific toolbars
- Web Links - Direct access to R2/CDI support sites

Command Add-ons

The Command Add-ons menu selection brings up a dialogue box listing all custom commands available to the user and a general description of each commands function. Instructions are contained in the dialogue box, which allow the user to browse the list of commands, select a command for use, or generate a more detailed description of the selected command functionality. See Appendix B for a list of the FS specific commands.

Toolbars

The Toolbars menu selection brings up a menu, which displays selections for the Main Toolbar, and the discipline specific toolbars that have been developed to meet FS needs. See Appendix C for FS Custom Toolbars.

The Main Toolbar

The Main Toolbar brings up a menu that offers a main toolbar with flyouts or individual toolbars that contain the main tools, grouped by function. The Main Toolbar was created to provide easy access to specific functions that benefit all users.

Main/Tools

Icon Menu	- Will take the user directly to the icon menu for selection of symbols
Add-on Commands	- Custom commands developed for R2 use
Open Recent Drawing	- Displays a list of recently opened drawings for user selection
Get Layer	- Displays the layer of user selected object
Get Point Between	- Allows user to find midpoint of 2 selected points while in a command

Main/Object Properties

Layer Set	- Set Current Layer
All Layers On	- Turns on all layers
Layer Off	- Turns off selected layers
Thaw All Layers	- Thaws all layers
Layer Freeze	- Freezes selected layers
Layer Lock	- Locks selected layers
Layer Unlock	- Unlocks selected layers
Set Layer/Color/Ltype	- Sets layer, color and/or linetype to match existing objects
Text Set	- Select text to match attributes

Main/Modify Objects

Change Layer	- Changes the layer of objects
Copy Properties	- Changes properties to match selected objects
Change Text Height	- Changes text height of selected text

Main/Construction Entities

Freestyle Construction Line	- Construction line drawn in no-plot pen
X-axis	- Draws construction line across x-axis at point specified
Y-axis	- Draws construction line across y-axis at point specified

X-Y axis - Draws construction line across x and y axis at point specified

Point - Places a point (node) at user specified location (no plot)

Erase Construction Entities - Erases selected construction entities

Main/View

Birdseye 1 - Transparent zoom (1)

Save Birdseye 1 - Save view of birdseye 1

Birdseye 2 - Transparent zoom (2)

Save Birdseye 2 - Save view of birdseye 2

Birdseye 3 - Transparent zoom (3)

Save Birdseye 3 - Save view of birdseye 3

The General Toolbar

The general toolbar was created for use by all disciplines on design and construction drawings. It contains the standard drawing sheet symbols for Forest Service drawings and has been divided into 6 flyouts.

General

Sheet specific symbols

- Insert 2nd sheet - takes user to the icon menu for border sheet selection
- Scale Markers - takes user to a dialogue box for selecting scale options
- North Arrow - standard north arrow

Detail specific symbols

- Section Cuts - standard section cut
- Detail Titles - standard detail titles
- Elevation Target - standard elevation target
- Detail Identification - detail bubble, multiple functions.

Dimension Wizard - imports and sets up dimension style, based on user selections

Text Wizard - imports and sets up text style, based on user selections

Leaders

- arc leader lines - 3 pt or 4 pt (single or double arc)
- loop leader lines - 3 pt or 4 pt (single or double arc)
- 'into' leader lines - 3 pt or 4 pt (single or double arc)

Break lines	- arc break symbol - straight line break symbol - stacked fractions - pipe break

The Architectural Toolbar

The architectural toolbar has been created to support the architectural design features.

Architectural

Architectural Plumbing fixtures	- This icon takes users to the icon menu for selection of plumbing fixtures
Architectural Labels	- flyout offers wall, door, room and window labels
Door Swing	- flyout containing one icon for creating door swings, and one icon for batt insulation

The Civil Toolbar

The civil toolbar is divided into four flyouts. The first flyout offers users five categories of symbols specific to civil engineering. The second flyout offers linetypes. The third flyout is for accessing hatch patterns and the fourth flyout (still in the development stage) will be for accessing civil related standard details.

Civil

General civil symbols	- takes user to the icon menu for selection
Drainage symbols	- takes user to the icon menu specific to drainage
Sewer symbols	- takes user to the icon menu specific to sewer
Water symbols	- takes user to the icon menu specific to water
Plumbing symbols	- takes user to the icon menu specific to plumbing
General linetypes	- takes user to the icon menu for general linetypes
Engineering linetypes	- offers civil engineering specific linetypes
Site linetypes	- offers site specific linetypes
General hatch patterns	- takes user to the icon menu for site related hatch patterns

The Electrical Toolbar

The electrical toolbar contains the symbols most often used on electrical drawings. By selecting the electrical engineering menu, a second menu offers the users a main electrical flyout toolbar containing symbols covering all three areas

of electrical drawings or individual toolbars that are specific to the three areas of electrical engineering - power, lighting, and controls.

Electrical/Power

- contains icons for the most often used graphic symbols related to electrical power
- the last icon takes the user to the icon menu for additional symbols

Electrical/Lighting

- contains icons for the most often used graphic symbols related to electrical lighting
- the last icon takes the user to the icon menu for additional symbols

Electrical/Controls

- contains icons for commonly used symbols on control drawings
- the last icon takes the user to the icon menu for additional symbols

The Mechanical Toolbar

The mechanical toolbar contains the symbols most often used on mechanical drawings. By selecting the Mechanical Engineering menu selection, a menu offers the users a main mechanical flyout toolbar or individual toolbars that are specific to the 3 areas of mechanical engineering.

The main mechanical flyout toolbar is a toolbar with three flyouts, each flyout specific to either the HVAC, the plumbing or the fire sprinkler system symbols. The individual toolbars offer the symbols to users on separate toolbars.

Mechanical/HVAC Toolbar

- contains icons for the most often used graphic symbols for HVAC drawings
- the last icon takes the user to the icon menu for additional symbols

Mechanical/Piping Toolbar

- contains icons for the most often used graphic symbols for plumbing/piping drawings
- contains icon for accessing plumbing/piping linetypes - IN CONSTRUCTION
- the last icon takes the user to the icon menu for additional symbols

Mechanical/Fire Sprinkler Toolbar

- Contains icons offering graphic symbols for fire sprinkler system drawings

The Structural Toolbar

The structural toolbar was developed to aid in the design and graphic representation of structural elements throughout the design and construction documents.

Structural

DD Welds	- weld symbol editor dialogue box
W section	- flyout containing steel shapes, AISC shape database
Bolt-Nut	- flyout containing one icon for bolt construction and one icon for nut construction
Gridline	- construction of grid lines and grid bubble (grid mark)
Graph $f(x)$	- This function draws a graph of a mathematical expression that you input using AutoCAD's calculator syntax.

Appendix D offers individual icon descriptions for each icon shown on the DSC Custom Toolbars.

Web Links

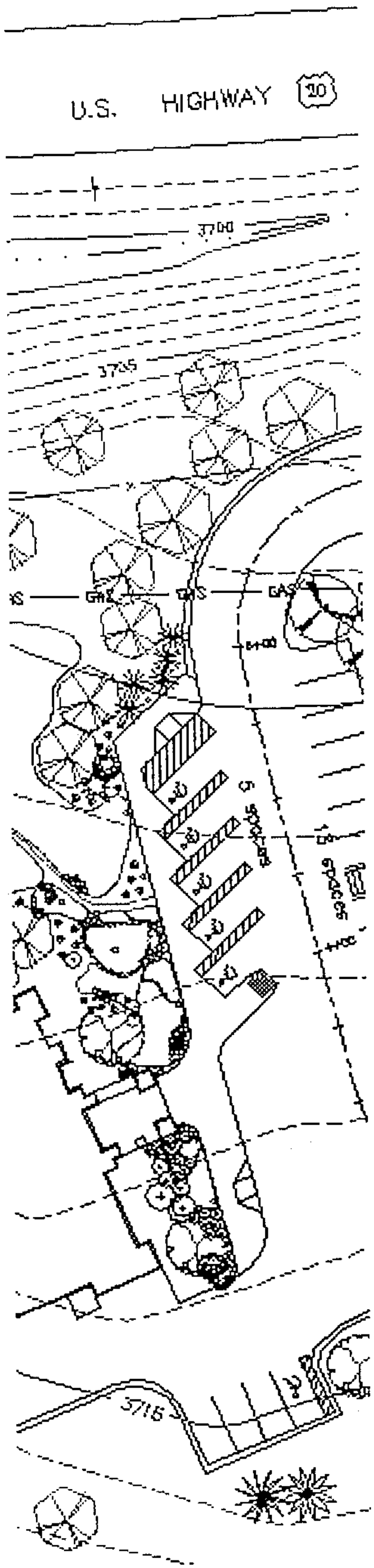
The Web Links selection on the FS pulldown menu offers the user an avenue for connecting to the CDI Web site.

CADD Resources

- This menu selection takes the user to the CADD intranet site. This site offers another avenue of support services to AutoCAD users at the Forest Service.

CADD Announcements

- This selection links the user to the CADD Announcement page of the CADD intranet site. This page displays up-to-date announcements and a listing of any changes made to our support web site.



Chapter 6

Project Folders, File Backups and Restorations

CADD Project Folders

AutoCAD Project Folders on the Network

The Regional Office file servers, intended for the storage and file sharing of active project drawings, are located and maintained in the Information Resources Management (IRM) Program Center.

All AutoCAD drawing files should be stored on the network file servers for ease of use, file sharing, and to ensure proper backup procedures can be done, as local hard drives are not backed up.

All project folders are available to CADD users through the k:\eng\projects\ drive. Folder structures shown in Chapter 2 should be followed by all users for storing and retrieving files. Only AutoCAD drawing files, graphic files and report documents relative to the project should be stored on the projects drive.

Another directory accessible to CADD users is the k:\eng\cadd\ directory, which stores all support files, including standard symbols, details, and template drawings, fonts, and any customization done to aid the user in creating drawings.

The standard folders on the k:\cadd directory are set up as follows:

k:\proto	Template drawings (.dwt)
k:\std-dwgs	Library of standard details
k:\support	Customization, production tools, plot configuration, font/shape files, lisp routines, and the latest AutoCAD bonus tools.

Again, local drives are not backed up. It is the responsibility of each user to store drawings on the file server so backups can be made, and so files can be shared between project members.

Backup Services

IRM is responsible for backups on all files stored on the network file servers at the Regional Office.

There are two types of system backups used at Regional Office –

Cloned Backups - Backups are performed each workday at 6:00 p.m., and the DFS drives (J, K, and L) are cloned and saved to a cloned directory under:

J:\fsfiles\cloned\...

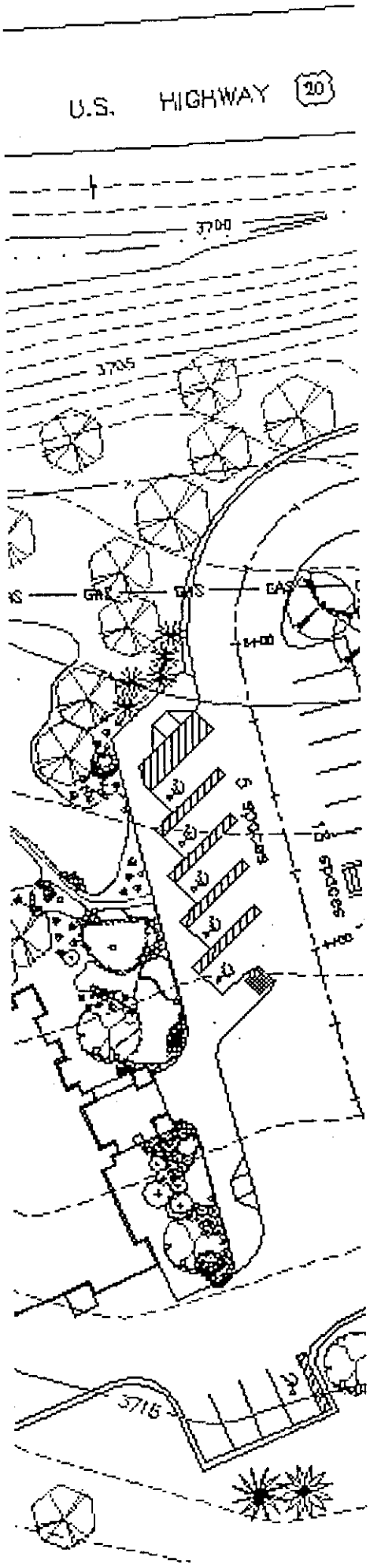
System Backups - System backups are performed nightly, and records everything currently on the DFS drives to tape. These files are archived for a period of 6 months.

Restore Procedures

When files have been lost or corrupted, they can be restored from the latest backup. The CADD user should always check the latest AutoCAD backup file (.bak) or AutoSave file (.$ac) first in their effort to restore a good file. If both do not produce a means to getting a workable file then the CADD user has two procedures to consider.

- ✓ If a file has been accidentally lost or corrupted, then the CADD user should immediately retrieve the 'cloned' file stored in the j:\fsfiles\cloned\... directory. The file stored here will be a copy of what was on the system as of 6 p.m. the night before. Note: All work done on a drawing during a given day will not be on the cloned copy from the night before.

- ✓ Drawing files can be restored from system backups. File restore requests should be via e-mail to the IRM group. The e-mail message is addressed to the Region 2 Mailroom (Mailroom R2), and in the subject line the words: Help Desk-File Restore. The body of the message should contain the complete path where the file can be found, as well as the date the requester wishes the file to be retrieved from. They will restore the original file to the original location. It is the user's responsibility to rename any file with the same filename prior to their restore request. **Any file with the same name in the folder they are restoring to will be overwritten.**



Chapter 7

Deliverables and Data Exchange

Deliverables and Data Exchange

General

The need to exchange electronic drawing files between the Forests, the Regional Office, CDI, and the A/E community, as well as the need to maintain consistency necessary for archival and retrieval of electronic drawings necessitates certain requirements that must be met on all projects. The following information can be used as a checklist of pertinent items before submitting work for approval.

Delivery Media

Acceptable media, in preference order is:

a.) CD-ROM
- preferred format, as it is also our archiving media. FS folder structure is to be maintained.

b.) Iomega ZIP Disks. FS folder structure is to be maintained.

c.) 3-1/2" high density floppy disks.
- Any disks need to be checked for complete information prior to submitting, to insure all electronic data is accessible.
- A/E's shall retain copies of all electronic data for a period of 90 days as a precautionary measure.
- 3-1/2" disks may contain compressed or "zipped" files only if they are self-extracting in nature.

When exchanging electronic media, an external label should contain, at a minimum, the following information:

a.) Format and version (e.g., Windows 95) of the operating system on which the media was created.

b.) The sequence number in the following format:

Disk N of T
where N = disk sequence number
and T = the total number of disks.

c.) The project description.

In addition, a transmittal sheet should accompany the media containing, at a minimum, the following information:

a.) The same information included on the external label of each tape, diskette, etc., and the file names and descriptions for each file.
b.) Any special instructions for restoring/transferring the files from the media.
c.) Certification that the delivery media is free of known computer viruses, including the name(s) and release date(s) of the virus scanning software used to check the media.

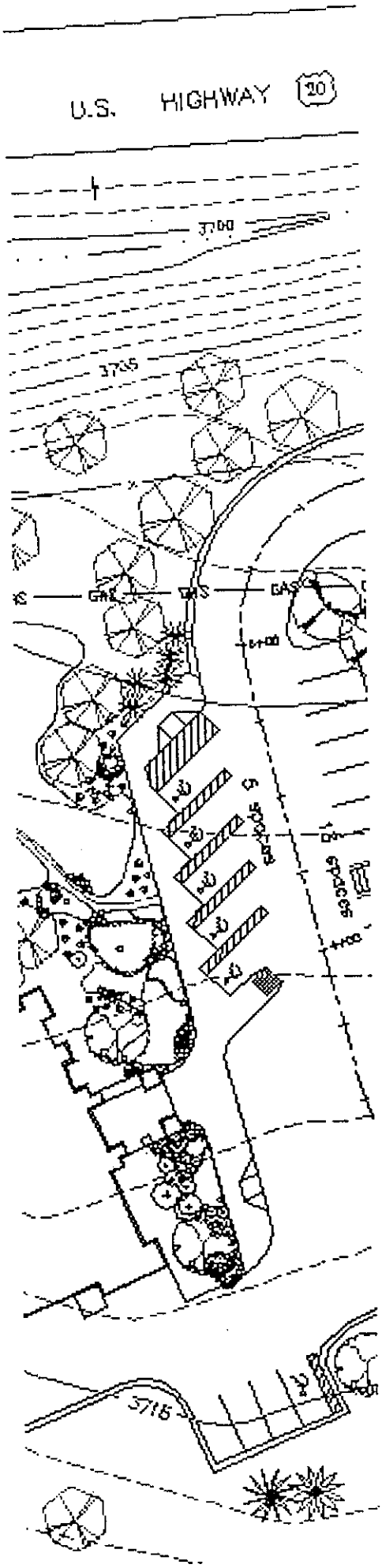
Format

All files should be directly readable by AutoCAD Release 14 or 2000 without conversion. Before a file is placed on the delivery media the following steps should be performed:

a.) Remove all extraneous graphics and drawing entities existing outside the drawing border.
b.) Zoom the drawing to the extents of the drawing area.
c.) Ensure that the only font type used in the drawing is ROMANS.shx or Architxt.shx
d.) Ensure that the pens are mapped to the FS Pen/Color configuration.
e.) Ensure that the folder structure and file naming conventions comply with the FS requirements.
f.) Pathnames for the electronic file (including external references) must be legible outside the left hand border.
g.) Ensure that the drawing can be plotted using the extents plot routine, without the need for additional manipulation. This includes maintaining the layer state used in all submitted plots. Consequently, there should be a separate drawing file for every plotted sheet submitted for the project.

Hard Copy

Pre-Design/Site Analysis Phase - One reproducible paper copy of drawings are to be provided for archival of this phase.



Appendix A

FS Template Drawings

Appendix A
Template Drawings

Architectural

Layer List for k:\eng\cadd\proto\arch.dwt

Layer Name	Linetype	Description
A-CLNG-GRID	CONTINUOUS	Ceiling grid
A-COLS	CONTINUOUS	Columns
A-COLS-BUBB	CONTINUOUS	Column bubble
A-COLS-GRID	CENTER	Column grid
A-DETL	CONTINUOUS	Details
A-DIM	CONTINUOUS	Dimensions
A-DOOR	CONTINUOUS	Doors
A-DOOR-JAMB	CONTINUOUS	Door jambs
A-ELEV	CONTINUOUS	Elevations
A-FURN	CONTINUOUS	Furniture
A-GLAZ	CONTINUOUS	Windows, window walls, curtain walls, glazed partitions
A-HATCH	CONTINUOUS	Hatching
A-PLUM-FIXT	CONTINUOUS	Plumbing fixtures
A-ROOF	CONTINUOUS	Roof
A-SECT	CONTINUOUS	Sections
A-SYMS	CONTINUOUS	Symbols
A-SYMS-LABL	CONTINUOUS	Labels: door, window, wall, etc.
A-TEXT	CONTINUOUS	Text
A-WALL	CONTINUOUS	Walls
A-WIND	CONTINUOUS	Windows
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

NCS layers? instead

Civil Details

Layer List for k:\eng\cadd\proto\civildet.dwt

Layer Name	Linetype	Description
C-DETL	CONTINUOUS	Details
C-DIM	CONTINUOUS	Dimensions
C-ELEV	CONTINUOUS	Elevations
C-HATCH	CONTINUOUS	Hatching
C-SECT	CONTINUOUS	Sections
C-TEXT	CONTINUOUS	Text
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

Civil Site

Layer List for k:\eng\cadd\proto\civilsite.dwt

Layer Name	Linetype	Description
C-BLDG	CONTINUOUS	Building footprints
C-BLDG-EXST	CONTINUOUS	Existing building footprints
C-CONT-INDEX	CONTINUOUS	Existing index contour lines and elevations
C-CONT-INTER	CONTINUOUS	Existing intermediate contour lines
C-DETL	CONTINUOUS	Details
C-DIM	CONTINUOUS	Dimensions
C-ELEV	CONTINUOUS	Elevations
C-HATCH	CONTINUOUS	Hatching
C-PKNG	CONTINUOUS	Parking lots
C-PKNG-EXST	CONTINUOUS	Existing parking
C-ROAD	CONTINUOUS	Roads
C-ROAD-EXST	CONTINUOUS	Existing roads
C-SECT	CONTINUOUS	Sections
C-SSWR	SAN_SEWER	Sanitary sewer (manholes, pumping stations)
C-SSWR-EXST	SAN_SEWER	Existing sanitary sewer
C-STRM	STM_SEWER	Storm drainage
C-STRM-EXST	STM_SEWER	Existing storm drainage
C-SYMS	CONTINUOUS	Symbols
C-TEXT	CONTINUOUS	Text
C-WATR	WATER	Domestic water (manholes, pumping stations, storage tanks)
C-WATR-EXST	WATER	Existing domestic water
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot

Cover Sheet
Project Specific Information

Layer List for k:\eng\cadd\proto\Covproj.dwt

Layer Name	Linetype	Description
G-INDX-HEAD	CONTINUOUS	Index header
G-INDX-TEXT	CONTINUOUS	Index text
G-PROJ-AROW	CONTINUOUS	Project arrow - locates specific project location
G-PROJ-BASE	CONTINUOUS	Existing site map - converted file (no layers)
G-NOTE	CONTINUOUS	Notes
G-SYMS	CONTINUOUS	Symbols
G-SYMS-LGND	CONTINUOUS	Map symbols and legend
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

Electrical

Layer List for K:\cadd\proto\Elec.dwt

Layer Name	Linetype	Description
E-DETL	CONTINUOUS	Details
E-DIM	CONTINUOUS	Dimensions
E-ELEV	CONTINUOUS	Elevations
E-HATCH	CONTINUOUS	Hatching
E-LITE	CONTINUOUS	Lighting
E-LITE-CIRC	CONTINUOUS	Lighting circuits
E-LITE-SITE	CONTINUOUS	Site lighting
E-POWR	CONTINUOUS	Power
E-POWR-CIRC	CONTINUOUS	Power circuits
E-POWR-EQPM	CONTINUOUS	Power equipment
E-POWR-SITE	CONTINUOUS	Site power
E-POWR-SITE-EXST	CONTINUOUS	Existing site power
E-POWR-WALL	CONTINUOUS	Power wall outlets and receptacles
E-SECT	CONTINUOUS	Sections
E-SYMS	CONTINUOUS	Symbols
E-TEXT	CONTINUOUS	Text
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

Electrical Auxiliary

Layer List for K:\cadd\proto\Elec-aux.dwt

Layer Name	Linetype	Description
E-CCTV	CONTINUOUS	Closed circuit TV
E-COMM	CONTINUOUS	Telephone communication outlets
E-DETL	CONTINUOUS	Details
E-DIMS	CONTINUOUS	Dimensions
E-ELEV	CONTINUOUS	Elevations
E-FIRE	CONTINUOUS	Fire alarm and fire extinguishers
E-HATCH	CONTINUOUS	Hatching
E-INTC	CONTINUOUS	Intercom system
E-LTNG	CONTINUOUS	Lightning protection system
E-SECT	CONTINUOUS	Sections
E-SERT	CONTINUOUS	Security
E-SOUN	CONTINUOUS	Sound or PA system
E-SYMS	CONTINUOUS	Symbols
E-TEXT	CONTINUOUS	Text
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

LA Details

Layer List for k:\eng\cadd\pproto\la-det.dwt

Layer Name	Linetype	Description
L-DETL	CONTINUOUS	Details
L-DIM	CONTINUOUS	Dimensions
L-ELEV	CONTINUOUS	Elevations
L-HATCH	CONTINUOUS	Hatching
L-SCHD	CONTINUOUS	Schedules
L-SECT	CONTINUOUS	Sections
L-SYMS	CONTINUOUS	Symbols
L-TEXT	CONTINUOUS	Text
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

LA Site

Layer List for k:\eng\cadd\proto\la-site.dwt

Layer Name	Linetype	Description
L-BLDG	CONTINUOUS	Building
L-BLDG-EXST	CONTINUOUS	Existing building
L-DETL	CONTINUOUS	Details
L-DETL-ANNO	CONTINUOUS	Detail text and dimensioning
L-DETL-HATCH	CONTINUOUS	Detail hatch patterns
L-DIM	CONTINUOUS	Dimensions
L-ELEV	CONTINUOUS	Elevations
L-GRADING	CONTINUOUS	New grading contours and spot elevations
L-HATCH	CONTINUOUS	Hatching
L-IRRG	CONTINUOUS	Irrigation system
L-PKNG	CONTINUOUS	Parking
L-PLNT	CONTINUOUS	Plant and landscape materials
L-PROP	CONTINUOUS	Property lines and survey benchmarks
L-ROAD	CONTINUOUS	Roads
L-SECT	CONTINUOUS	Sections
L-SITE	CONTINUOUS	Site improvements
L-SYMS	CONTINUOUS	Symbols
L-TEXT	CONTINUOUS	Text
L-WALK	CONTINUOUS	Walks and steps
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

Mechanical

Layer List for k:\eng\cadd\proto\mech.dwt

Layer Name	Linetype	Description
M-CONT	CONTINUOUS	Controls and instrumentation
M-CWTR-EQPM	CONTINUOUS	Chilled water equipment
M-CWTR-RTRN	CHILL_RETURN	Chilled water return piping
M-CWTR-SUPL	CHILL_SUPPLY	Chilled water supply piping
M-DETL	CONTINUOUS	Details
M-DETL-ANNO	CONTINUOUS	Detail text and dimensioning
M-DETL-HTCH	CONTINUOUS	Detail hatch patterns
M-DIM	CONTINUOUS	Dimensions
M-ELEV	CONTINUOUS	Elevations
M-ELHT-EQPM	CONTINUOUS	Electric heat equipment
M-EXHS	CONTINUOUS	Exhaust system
M-EXHS-DUCT	CONTINUOUS	Exhaust system ductwork
M-EXHS-EQPM	CONTINUOUS	Exhaust system equipment
M-EXHS-RFEQ	CONTINUOUS	Rooftop exhaust equipment
M-FUEL	CONTINUOUS	Fuel system piping
M-HOTW-EQPM	CONTINUOUS	Hot water equipment
M-HOTW-RTRN	HOT_RETURN	Heating water return piping
M-HOTW-SUPL	HOT_SUPPLY	Heating water supply piping
M-HATCH	CONTINUOUS	Hatching
M-HVAC	CONTINUOUS	HVAC system
M-HVAC-CDFF	CONTINUOUS	HVAC diffusers (ceiling)
M-HVAC-DUCT	CONTINUOUS	HVAC ductwork
M-HVAC-EQPM	CONTINUOUS	HVAC equipment
M-HVAC-ODFF	CONTINUOUS	HVAC diffusers (other)
M-SECT	CONTINUOUS	Sections
M-SYMS	CONTINUOUS	Symbols
M-TEXT	CONTINUOUS	Text
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.

Plumbing

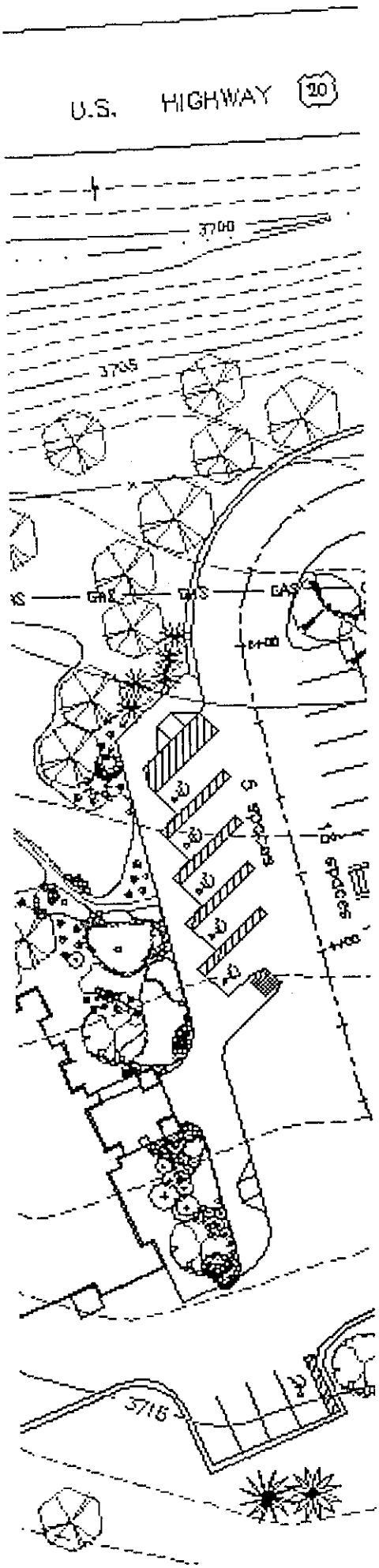
Layer List for k:\eng\cadd\proto\plumb.dwt

Layer Name	Linetype	Description
P-DETL	CONTINUOUS	Details
P-DETL-HATCH	CONTINUOUS	Detail hatch patterns
P-DIM	CONTINUOUS	Dimensions
P-DOMW-COLD	COLDWATER	Domestic cold water
P-DOMW-EQPM	CONTINUOUS	Domestic hot and cold water equipment
P-DOMW-HOTR	HOTRTN	Domestic hot water return
P-DOMW-HOTS	HOTWATER	Domestic hot water supply
P-DOMW-PIPE	CONTINUOUS	Domestic hot and cold water piping
P-DOMW-RISR	CONTINUOUS	Domestic hot and cold water risers
P-ELEV	CONTINUOUS	Elevations
P-HATCH	CONTINUOUS	Hatching
P-SANR	CONTINUOUS	Sanitary drainage
P-SANR-FIXT	CONTINUOUS	Plumbing fixtures
P-SANR-FLDR	CONTINUOUS	Floor drains
P-SANR-PIPE	CONTINUOUS	Sanitary piping
P-SANR-RISR	CONTINUOUS	Sanitary risers
P-SECT	CONTINUOUS	Sections
P-STRM	CONTINUOUS	Storm drainage system
P-STRM-PIPE	CONTINUOUS	Storm drain piping
P-STRM-RFDR	CONTINUOUS	Roof drains
P-STRM-RISR	CONTINUOUS	Storm drain risers
P-SYMS	CONTINUOUS	Symbols
P-TEXT	CONTINUOUS	Text
P-VENT	VENT	Vent
P-WASTE	WASTEUG	Waste - below grade
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrows, title bubbles, etc.

Structural

Layer List for k:\eng\cadd\proto\struc.dwt

Layer Name	Linetype	Description
S-ABLT	CONTINUOUS	Anchor bolts
S-BEAM	CONTINUOUS	Beams
S-COLS	CONTINUOUS	Columns
S-DETL	CONTINUOUS	Details
S-DETL-HATCH	CONTINUOUS	Detail hatch patterns
S-DIM	CONTINUOUS	Dimensions
S-ELEV	CONTINUOUS	Elevations
S-FNDN	CONTINUOUS	Foundation
S-FNDN-PILE	CONTINUOUS	Foundation piles and drilled piers
S-FNDN-RBAR	CONTINUOUS	Foundation reinforcing
S-FRAM-BEAM	CONTINUOUS	Framing beams
S-FRAM-DECK	CONTINUOUS	Framing structural floor deck
S-FRAM-JOIS	CONTINUOUS	Framing joists
S-GRID	CONTINUOUS	Column grid
S-GRID-IDEN	CONTINUOUS	Column grid tags
S-HATCH	CONTINUOUS	Hatching
S-METL	CONTINUOUS	Miscellaneous metal
S-SECT	CONTINUOUS	Sections
S-SECT-IDENT	CONTINUOUS	Section identification
S-SLAB	CONTINUOUS	Slab
S-SLAB-JOIN	CONTINUOUS	Slab control joints
S-SLAB-RBAR	CONTINUOUS	Slab reinforcing
S-SYMS	CONTINUOUS	Symbols
S-TEXT	CONTINUOUS	Text
S-WALL	CONTINUOUS	Structural bearing and shear walls
Z-CONST	CONTINUOUS	Construction lines (no plot)
Z-NOPLOT	CONTINUOUS	No plot
Z-SYMS-GENR	CONTINUOUS	General sheet info: scales, north arrow, title bubbles, etc.



Appendix B

FS Command Add-Ons

Appendix B
Command Add-ons

The AutoCAD commands listed below have been created for use at CDI and can be typed in on the command line, or can be accessed from the FS menu.

Commands Add-ons

2ldr	- Creates a leader line using two arcs and an arrowhead.
2lldr	- Creates a loop leader line using two arcs.
2tldr	- Creates a leader pointing to an area, using two arcs.
angle	- Returns an angle by picking a vertex and beginning and ending angle
arctxt	- Draws text around an arc or circle object
atext	- Draws text around an arc or circle object
ba	- Macro to break an object in two at a single point
batt	- Draws batt insulation using a polyline
'between	- Locate a point midway between two points
bolt	- Draws a bolt based on user input
burst	- Explodes blocks, but retains attribute contents
chlayer	- Changes the layer of objects. Creates the layer if it does not exist.
chline	- Globally change properties of line objects
chpoly	- Globally change properties of heavy polylines. Change plinegen, bulge fix and remove xdata.
cht	- Globally change text properties
chtexth	- Globally change text height of text or mtext
conse	- Erase construction lines, but not other objects.

consline - Draw lines on a construction layer, in a no-plot color.

conspt - Draw points on a construction layer, in a no-plot color.

consx - Draw a horizontal xline on a construction layer, in a no-plot color.

consxy - Draw a horizontal and vertical xline on a construction layer, in a no-plot color.

consy - Draw a vertical xline on a construction layer, in a no-plot color.

copyrot8 - Copy and rotate together in one command

cpprop - Change properties (layer, color, linetype) of objects to those properties of an example object

cswap - Swap colors in your drawing to bylayer, or for example, change all red objects to yellow. Also works with objects in blocks.

ddpen - FS Standard Color Chart. Can be used transparently with 'ddpen.

ddsc - Inserts scale markers

ddwelds - Inserts weld symbols

dets - Inserts detail titles

dtid - Inserts detail reference ID's as shown on page 21 of NPS-10

dwiz - Dimension Wizard will set up Dimension Styles for you

explore - (NT4.0 and Win95 only) - Starts Windows Explorer in the folder of the current drawing.

f0 - (That's "F" and a Zero) - Fillet radius zero

fcr - Macro to draw a rectangular 3d-face by picking 2 corners. Includes an elevation option.

fixldr1 - Forces leaders to have arrowheads rather than ticks or other user defined blocks.

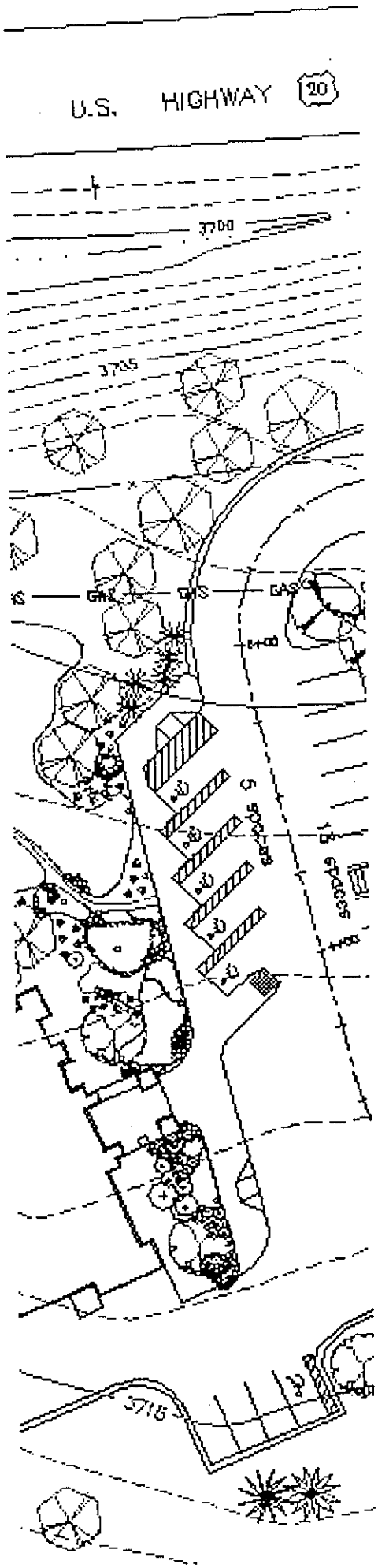
fr - Inserts stacked fractions

'glr	- Returns the layer of a selected object, esp. useful within a block or xref.
gridline	- Inserts grid lines and grid marks
gridmark	- Inserts grid marks
iconmenu	- Insert FS symbols, 2nd sheets, details etc. from an icon driven menu
keynote	- Inserts keyed notes in your drawing
ldr	- Creates an arc leader line
leo	- "Layer Exclusive On" turns all layers off except those you specify by name or by picking objects
leu	- "Layer Exclusive Unlock" locks all layers except those you specify by name or by picking objects
lfrz	- Freeze layers by name or by picking objects
lldr	- Creates an arc style loop leader line
llist	- Creates a text file listing the current drawing's layer settings
llock	- Lock layers by name or by picking objects
loff	- Turn off layers by name or by picking objects
lon	- Macro to turn on all layers
lql	- Quick leader - loop. Also offers leader options through a dialogue box.
ls	- Changes the current layer to the layer name typed or to that of a selected object.
lthaw	- Macro to thaw all layers
lunlock	- Unlock layers by name or by picking layers
nut	- Draws a nut based on user input
openxref	- Allows editing of xref drawing by opening two autocad sessions
pdir	- Creates project paths on the K: drive

pen	- Set your current layer, color, linetype to those properties of a selected object
perpdoff	- Set crosshairs (snapang) to zero
perpdon	- Set crosshairs (snapang) to angle of a selected line
plrev	- Reverse a polyline's start/end
qpurge	- (R14) A quick way to purge all objects in the drawing. Executes purge multiple times to purge nested objects.
rmelev	- Inserts room elevation callout bubbles
'se	- "Select by Entity" is a quick way to select specific types of objects (quicker than Filter)
sect	- Inserts section cuts
shapes	- AISC steel shapes. Dialogue boxes prompt for user input.
'sl	- "Select by Layer" is a quick way to select objects by the layer they're on (quicker than Filter)
t2mt	- Convert Text to Mtext
tldr	- Creates an arc style leader pointing to an area
tmenu	- A text only replacement for the Iconmenu command. Useful when your screen resolution is to low to run Iconmenu.
topoly	- Joins polylines, lines and arcs into continuous polylines. Faster then using Pedit/Join.
tql	- Quick leader into an area. Also offers leader options through a dialogue box
tset	- Set your current text font, height etc. to those of existing text object
twiz	- Text Wizard will set up Text Styles for you
two	- Text wipeout. A text mask for Rel. 14. Supports only dtext.
vpsc	- Reports a viewport's scale (i.e. 48.00 to 1.)

websec - Draws cross section of common steel shapes

wpoints - Write point coordinate data to a text file



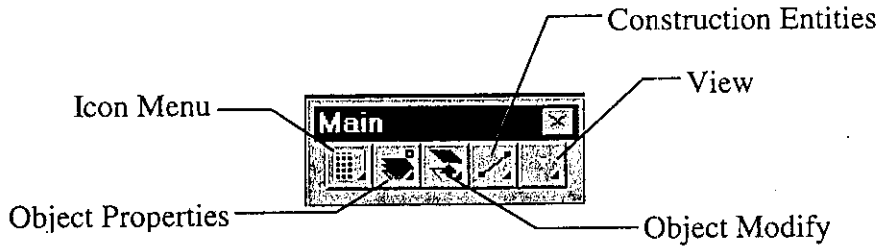
Appendix C

FS Custom Toolbars

Appendix C
Custom Toolbars

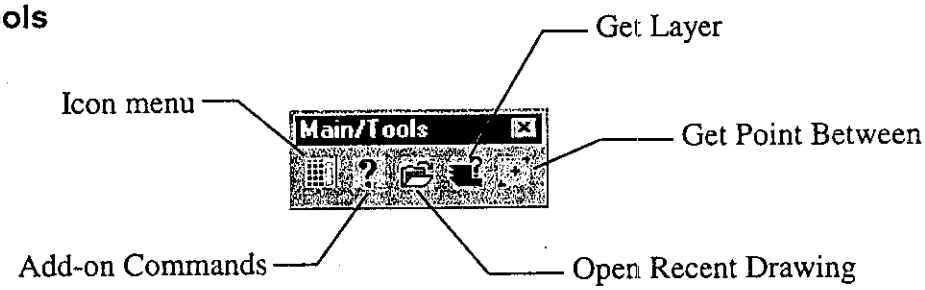
Below is a graphic representation of the Main Toolbar. Additional main tools can be accessed from the flyouts off of the main toolbar or from individual toolbars that are grouped by function. To access the tools in AutoCAD, select the toolbar, click on the icon and follow the prompts.

Main Toolbar

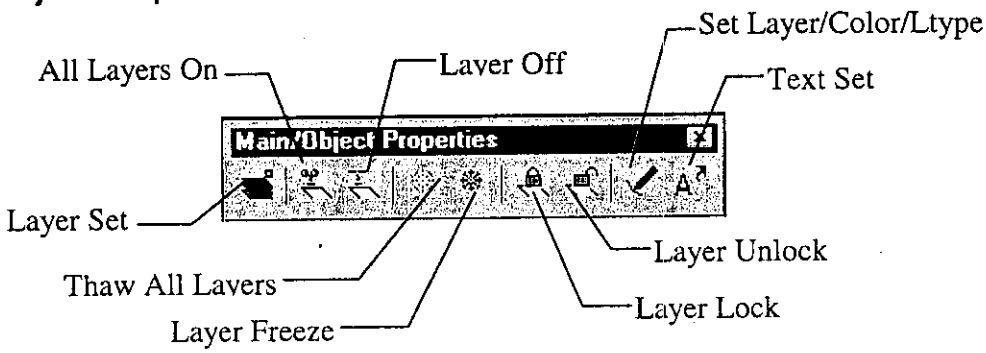


The tools available from the flyouts on the Main Toolbar have also been incorporated into individual toolbars, as shown below.

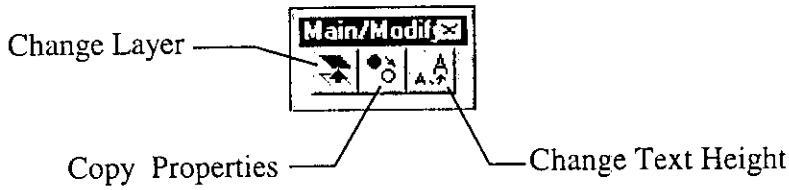
Main/Tools



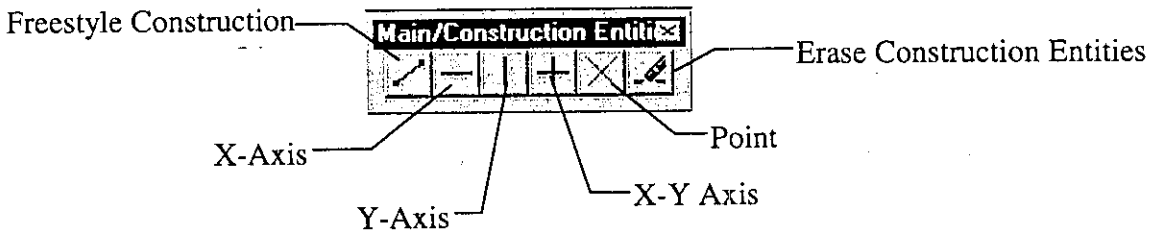
Main/Object Properties



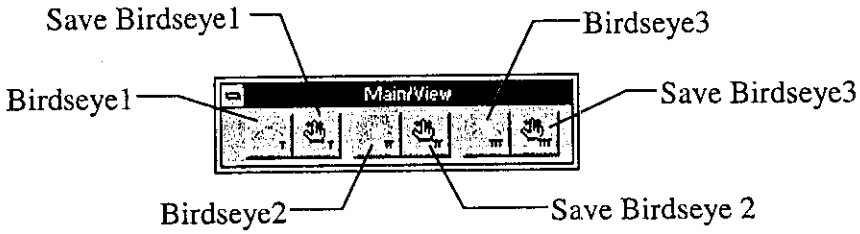
Main/Modify Objects



Main/Construction Entities



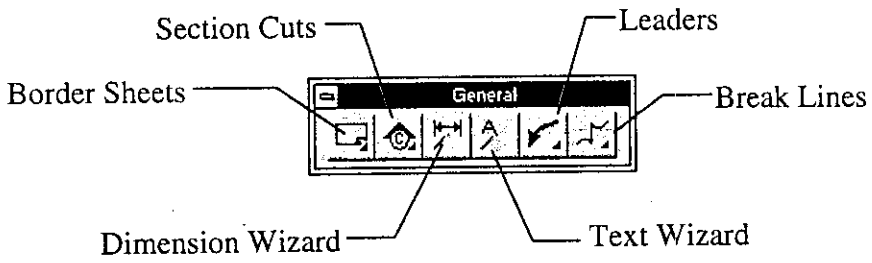
Main/View



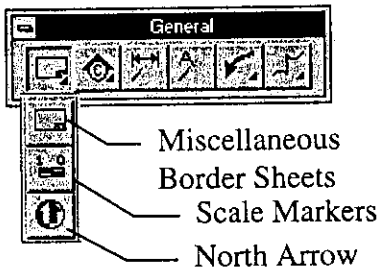
General Toolbar

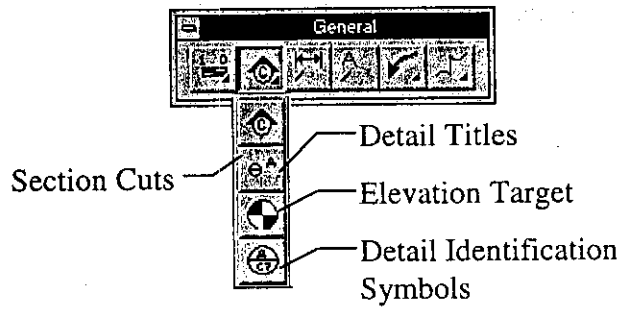
The General Toolbar was developed for use by all disciplines. It contains the standard drawing sheet symbols for Region 2 drawings and is divided into four flyouts and two 'wizard' selections.

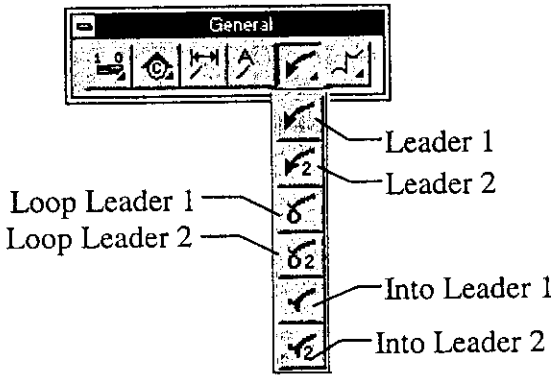
General Toolbar



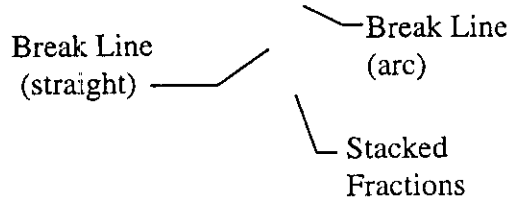
General Toolbar Flyouts





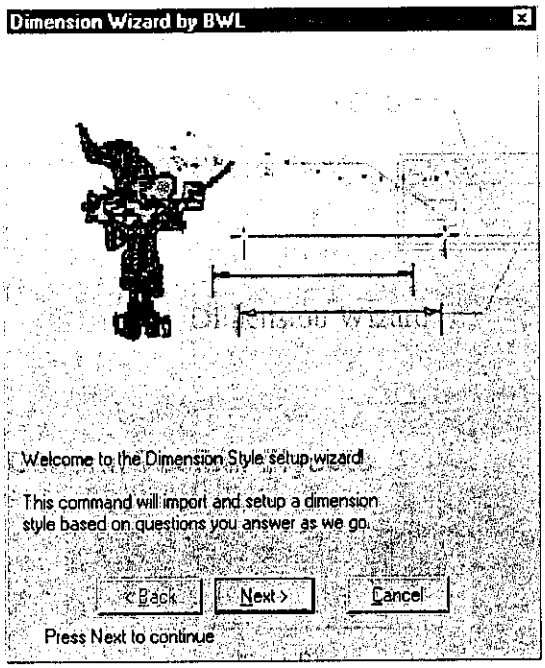


Error! Not a valid link.

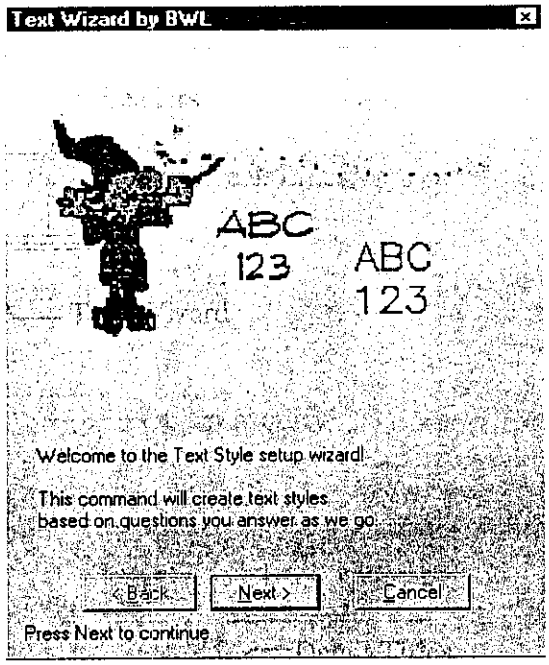


Wizards

The Text Wizard and Dimension Wizard were developed to simplify the setup process for creating standard text styles and dimension styles. The 'wizards' are accessed by selecting the icon from the General Toolbar. A dialogue box will appear prompting for user selected settings.



Text Wizard

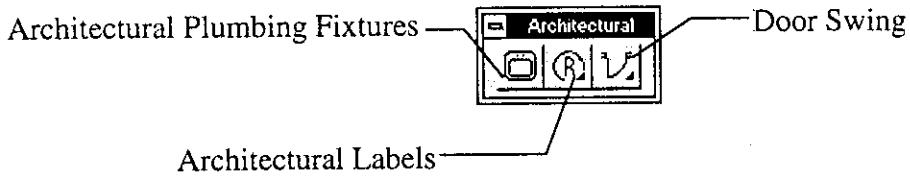


Dimension Wizard

Architectural Toolbar

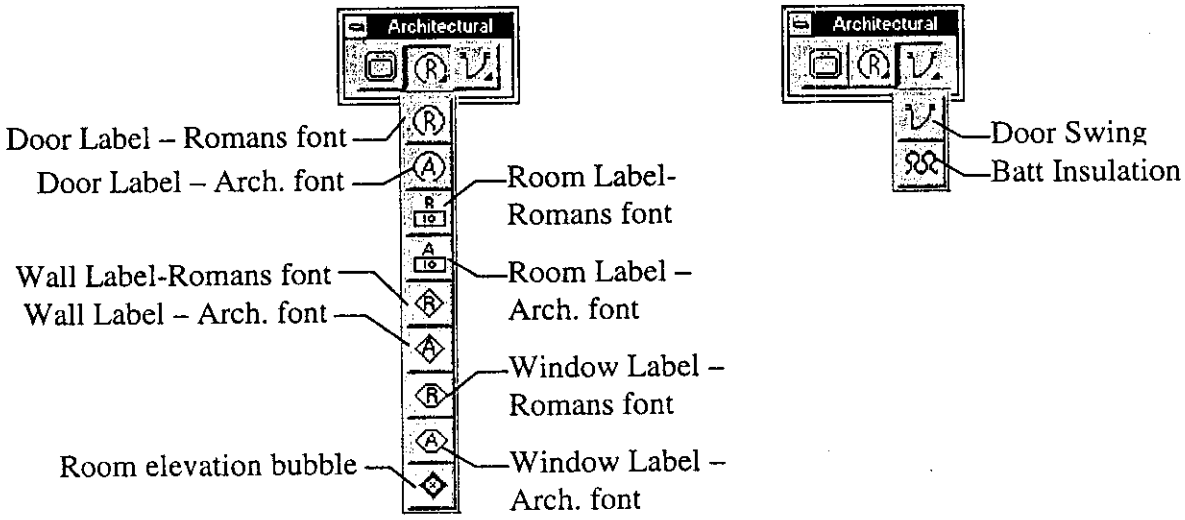
The Architectural Toolbar below has been created to support the architectural design features.

Architectural Toolbar



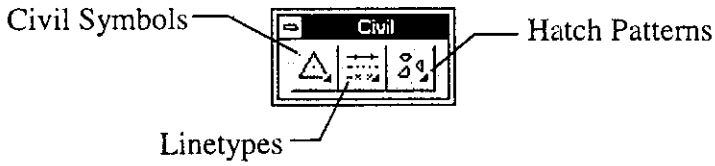
The first icon on the Architectural Toolbar will take the user to an icon menu, which will offer a variety of architectural plumbing symbols. The second icon offers door, wall and window labels, accessible from a flyout. The third icon offers two routines - one for creating door swings, and the other for creating batt insulation.

Architectural Toolbar Flyouts

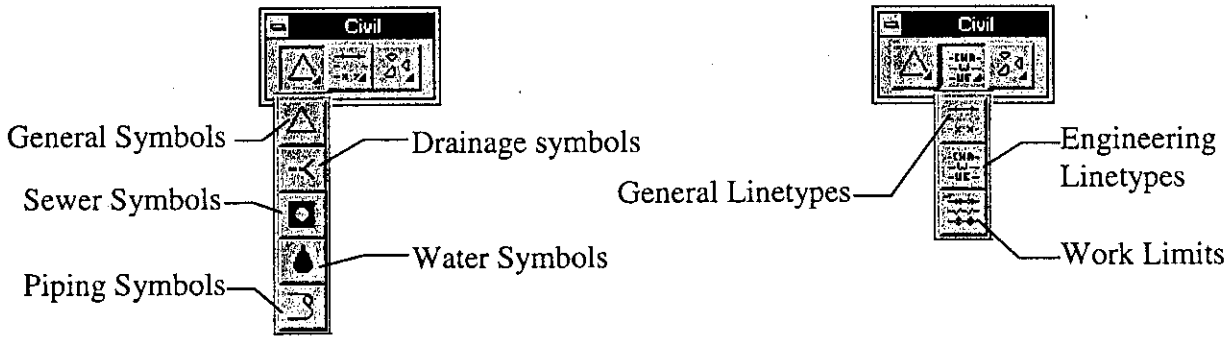


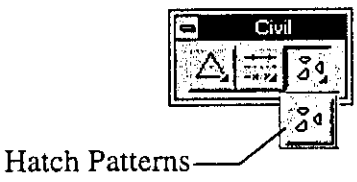
Civil Toolbar

The Civil Toolbar is divided into four flyouts, which encompass civil symbols, linetypes, hatch patterns and standard details. Each flyout takes the user to an icon menu for selection of individual symbols.



Civil Toolbar Flyouts

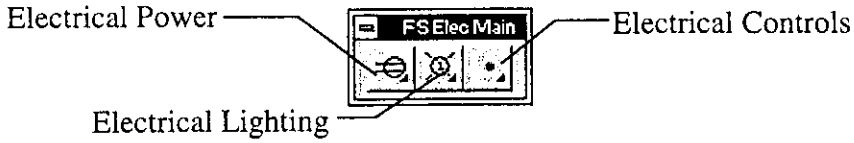




Electrical Toolbar

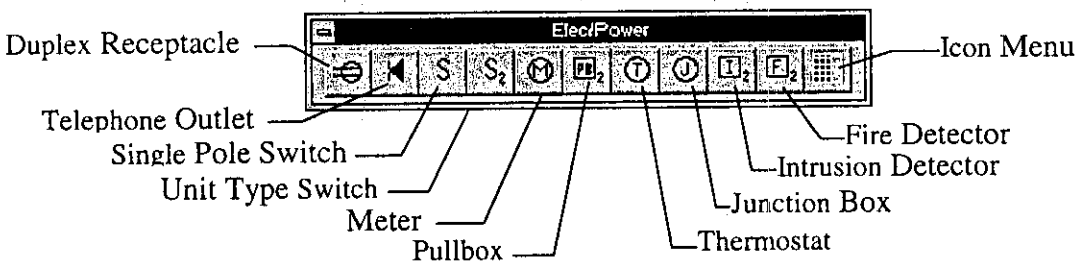
The Electrical Toolbar offers the users tools that can be accessed from flyouts off the main electrical toolbar or from individual toolbars that have been grouped by function. The electrical tools have been grouped into three categories - power, lighting and controls.

Electrical Main Toolbar

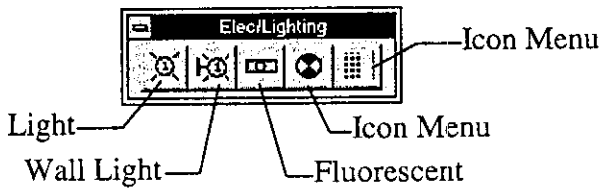


The individual toolbars created for power, lighting and controls offer users immediate access to the most often used graphic symbols for each function. The last icon on each toolbar takes the user to the icon menu for additional symbols.

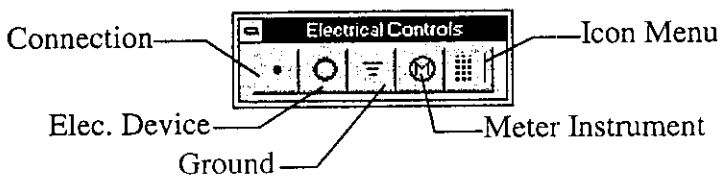
Elec/Power



Elec/Lighting



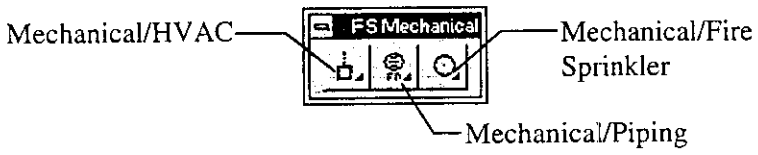
Elec/Controls



Mechanical Toolbar

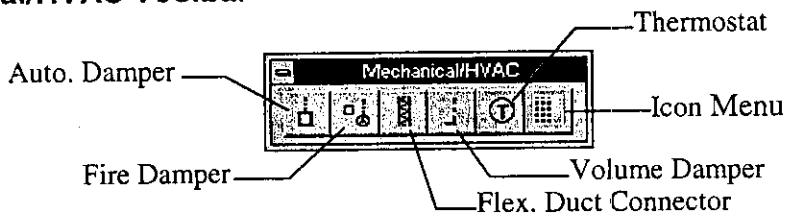
The Mechanical Toolbar offers the users tools that can be accessed from flyouts off the main mechanical toolbar or from individual toolbars that have been grouped by function. The mechanical tools have been grouped into three categories - HVAC, piping and fire sprinkler systems.

Mechanical Main Toolbar

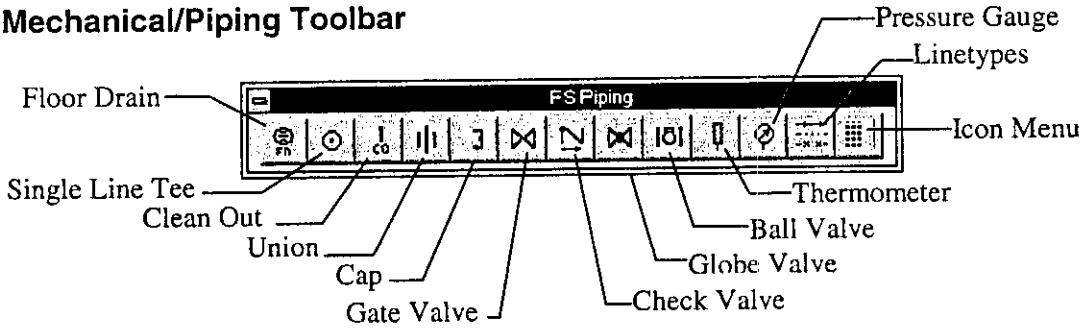


The individual toolbars created for HVAC, piping and fire sprinkler systems offer users immediate access to the most often used graphic symbols. The last icon on each toolbar takes the user to the icon menu for additional symbols.

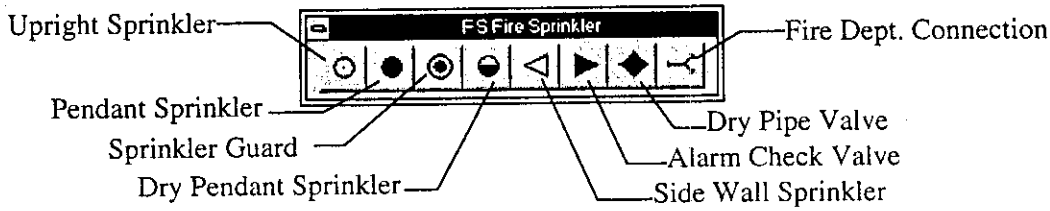
Mechanical/HVAC Toolbar



Mechanical/Piping Toolbar

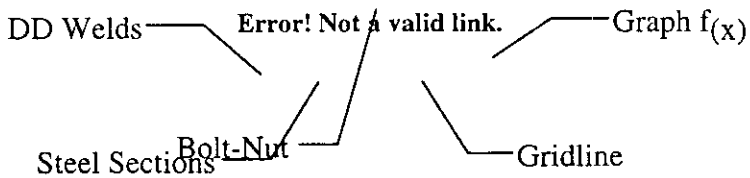


Mechanical/Fire Sprinkler Toolbar

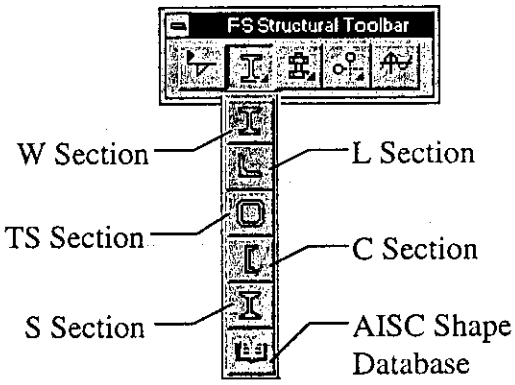


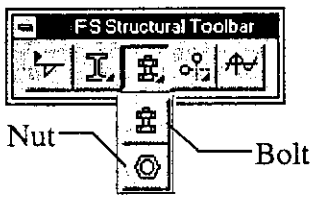
Structural Toolbar

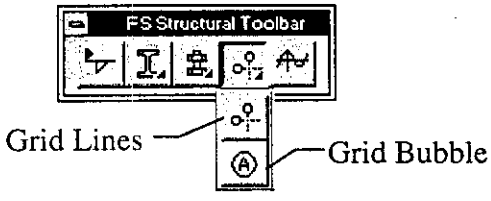
The Structural Toolbar was developed to aid in the design and representation of structural elements throughout the design and construction documents.

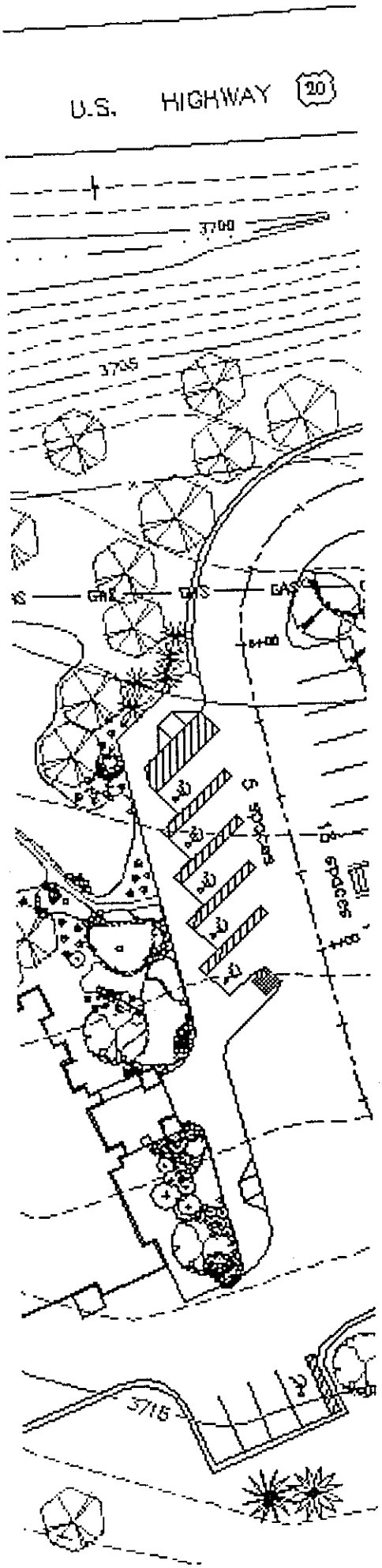


Structural Toolbar Flyouts









Appendix D

Text Height vs. Plotting Height

Appendix D
Text Height vs. Plotting Height
(Relative to Model Space)

When Model Space Drawing Unit = 1 Inch

		Text Height:						
Plot Scale	PS Zoom XP	.100	.130	.150	.175	.240	.500	Multiplier
Full	1	. 100	.130	.150	.175	.240	.500	1.00
Half	1/2	.200	.260	.300	.350	.480	1.00	2.00
3"=1'	1/4	.400	.520	.600	.700	.960	2.00	4.00
1 1/2"=1'	1/8	.800	1.04	1.20	1.40	1.92	4.00	8.00
1"=1'	1/12	1.20	1.56	1.80	2.10	2.88	6.00	12.0
3/4"=1'	1/16	1.60	2.08	2.40	2.80	3.84	8.00	16.0
1/2"=1'	1/24	2.40	3.12	3.60	4.20	5.76	12.0	24.0
3/8"=1'	1/32	3.20	4.16	4.80	5.60	7.68	16.0	32.0
1/4"=1'	1/48	4.80	6.24	7.20	8.40	11.52	24.0	48.0
3/16"=1'	1/64	6.40	8.32	9.60	11.2	15.36	32.0	64.0
1/8"=1'	1/96	9.60	12.48	14.40	16.8	23.04	48.0	96.0
3/32"=1'	1/128	12.8	16.64	19.20	22.4	30.72	64.0	128
1/16"=1'	1/192	19.2	24.96	28.80	33.6	46.08	96.0	192

When Model Space Drawing Unit = 1 Foot

		Text Height:						
Plot Scale	PS Zoom XP	.100	.130	.150	.175	.240	.500	Multiplier
Full	12	.0083	.0108	.0125	.0146	.02	.0417	.0833
Half	6	.0167	.0217	.0250	.0292	.04	.0833	.1667
1"=10'	1/10	1	1.3	1.5	1.75	2.4	5	10
1"=20'	1/20	2	2.6	3.0	3.5	4.8	10	20
1"=25'	1/25	2.5	3.25	3.75	4.375	6	12.5	25
1"=30'	1/30	3	3.9	4.5	5.25	7.2	15	30
1"=40'	1/40	4	5.2	6.0	7	9.6	20	40
1"=50'	1/50	5	6.5	7.5	8.75	12	25	50
1"=60'	1/60	6	7.8	9.0	1.5	14.4	30	60
1"=100'	1/100	10	13	15	17.5	24	50	100

Larger scales when Model Space drawing unit = 1 Foot

		Text Height:						
Plot Scale	PS Zoom XP	.100	.130	.150	.175	.240	.500	Multiplier
1"=200'	1/200	20	26	30	35	48	100	200
1"=300'	1/300	30	39	45	52.5	72	150	300
1"=400'	1/400	40	52	60	70	96	200	400
1"=500'	1/500	50	65	75	87.5	120	250	500
1"=750'	1/750	75	97.5	112.5	131.25	180	375	750
1"=1000'	1/1000	100	130	150	175	240	500	1000
1"=2000'	1/2000	200	260	300	350	480	1000	2000
1"=2500'	1/2500	250	325	375	437.5	600	1250	2500
1"=3000'	1/3000	300	390	450	525	720	1500	3000
1"=4000'	1/4000	400	520	600	700	960	2000	4000

Model Space drawing unit = 1 Mile

		Text Height:						
Plot Scale	PS Zoom XP	.100	.130	.150	.175	.240	.500	Multiplier
1"=1mi	1	.1	.13	.15	.175	.24	.5	1
1"=2mi	1/2	.2	.26	.30	.35	.48	1	2
1"=3mi	1/3	.3	.39	.45	.525	.72	1.5	3
1"=4mi	1/4	.4	.52	.60	.7	.96	2	4
1"=5mi	1/5	.5	.65	.75	.875	1.2	2.5	5
1"=6mi	1/6	.6	.78	.90	1.05	1.44	3	6
1"=7mi	1/7	.7	.91	1.05	1.225	1.68	3.5	7
1"=8mi	1/8	.8	1.04	1.20	1.4	1.92	4	8

Appendix E
Keyboard Aliases

Command	Alias
ARC	A
ARRAY	AR
BLOCK	BL
BREAK	B
Contruction lines:	
Erase	CE
X axis	CX
Y axis	CY
X & Y axis	CXY
CHANGE	CH
CIRCLE	C
COLOR	CL
COPY	CP
DDATTE	DDA
DDCHANGE	DDC
DDEDIT	DDE
DDINSERT	DDI
DDLTYPE	DDL
DDMODIFY	DDM
DDSTYLE	DDS
DISTANCE	DS
DTEXT	DT
DVIEW	DV
ELLIPSE	ES
ERASE	E
ERASE LAST	EL
EXPLODE	X
EXTEND	EX
FILLET	F
FILLET RAD. 0	F0
GROUP	G
INSERT	I
LAYER	LA
More layer stuff:	
SET (by pick)	LS
ON	LO
OFF (by pick)	LF
LOCK (by pick)	LL
UNLOCK (pick)	LU
EXCLUSIVE UNLOCK (by pick)	LEU
EXCLUSIVE ON (by pick)	LEO

Command	Alias
LEADER	LE
LENGTHEN	LG
LINE	L
LINETYPE	LT
LIST	LI
MOVE	M
MIRROR	MR
MSPACE	MS
MTEXT	MT
OFFSET	O
PAN	'P
PLINE	PL
PSPACE	PS
QSAVE	S
RECTANGLE	RE
REDRAW	'R
REGENALL	RG
ROTATE	RO
SCALE	SC
SELECT BY LAYER	'SL
SELECT BY ENTITY	'SE
STRETCH	ST
TEXT	T
TILEMODE	TM
TRIM	TR
VIEW RESTORE	VR
XLINE	XL
ZOOM	Z
ZOOM P	ZP
ZOOM VMAX	ZV

Accelerator Keys	
F1	FROM
F2	*Flip screen
F3	Center object snap
F4	Endpoint object snap
F5	Intersection snap
F6	Midpoint object snap
F7	*Grid toggle
F8	*Ortho toggle
F9	*Snap toggle
F10	*Tablet toggle
F11	Nearest object snap
F12	Perpendicular snap

* Indicates Acad for Windows default.

Other AutoCAD Hot Keys	
Ctrl+A	Group on/off
Ctrl+B	Snap to grid on/off
Ctrl+C	Copy to clipboard
Ctrl+D	Coords toggle
Ctrl+E	Isoplane toggle
Ctrl+G	Grid on/off
Ctrl+L	Ortho on/off
Ctrl+N	New drawing
Ctrl+O	Open drawing
Ctrl+P	Plot drawing
Ctrl+R	Change viewports
Ctrl+S	Qsave
Ctrl+T	Tablet on/off
Ctrl+V	Paste to clipboard
Ctrl+X	Cut to clipboard
Ctrl+Z	Undo

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